

TM 11-5821-212-20

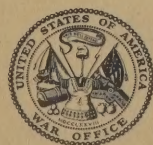
DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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RADIO TRANSMITTING SET AN/FRT-51

ORGANIZATIONAL MAINTENANCE



HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1959

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 5,000-volt dc high-voltage circuits, or on the 220-volt ac line connections.

DON'T TAKE CHANCES!

DANGEROUS RF VOLTAGES ARE EXPOSED AT THE RF OUTPUT METERS AND AT THE TRANSMISSION LINE ANTENNA COUPLER TERMINALS.

5,000 VOLTS DC EXIST IN THE FOLLOWING UNITS OF THE TRANSMITTING SET:

Radio Frequency Amplifier AM-1154A/G
Power Supply PP-1234/G.

TECHNICAL MANUAL

Organizational Maintenance

TRANSMITTING SET, RADIO AN/FRT-51

TM 11-5821-212-20 }
CHANGE NO. 1 }

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 2 October 1963

TM 11-5821-212-20, 24 August 1959
is changed as follows:

Page 2, paragraph 1. Make the following changes:

Delete subparagraph b.

Delete subparagraph d.

Add paragraph 1.1 after paragraph 1.

1.1. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. DA Pam 310-4 is an index of current Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders that are available through publication supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

Delete paragraph 2 and substitute:

2. Forms and Records

For applicable forms and records, see paragraph 2, TM 11-5821-212-10.

Page 17. Delete paragraph 19 and substitute:

19. Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable

condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of Transmitting Set, Radio AN/FRT-51 at the second echelon level are made at quarterly intervals unless otherwise directed by the commanding officer.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

Add paragraphs 19.1 and 19.2 after paragraph 19.

19.1. Quarterly Preventive Maintenance

Quarterly preventive maintenance checks and services on Transmitting Set, Radio AN/FRT-51 are required. Daily services constitute a part of the quarterly preventive maintenance checks and services and must be performed concurrently. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (par. 19.2) in the sequence listed.

19.2. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Installation	See that the equipment is properly installed	Chapter 2, Section 1
2	Internal cleanliness	See that the equipment is clean	Fig. 6
3	Preservation	Clean rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion.	TM 9-213
4	Completeness	See that the equipment is complete	App. II, TM 11-5821-212-10
5	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4
6	Modifications ...	Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All routine MWO's must be scheduled.	TM 38-750
7	Pluckout items ..	Inspect clamps and seating of pluckout items. Check for wrong, bent, or broken parts. Inspect vacuum capacitors for loose envelopes, and fittings. (Do not damage the seal-off tip on the envelope).	Figs 28 through 38
8	Fuses	Check to see that fuses are of the correct rating, and that authorized spares are on hand.	TM 11-5821-212-10, par. 6
9	Rack	See that all bolts, nuts, and washers are correctly positioned and properly tightened. Check for cracked, bent, or broken brackets.	TM 11-5821-213-10, Figs. 4, 5, and 7
10	Connections, interchassis	Check to see that plugs and sockets are clean, intact, and not loose fitting.	Par. 8
11	Capacitors	Check large capacitors for evidence of leaks, bulges, loose connections, dirt and corrosion.	Figs. 27 and 32
12	Resistors	Inspect all resistors for evidence of blistering or overheating (charring).	Fig. 25
13	Circuit breakers and relays.	Check the circuit breaker to verify that it is effective in removing or permitting power to be applied to the equipment. Look for burned or damaged relay contacts.	TM 11-5821-212-10, fig. 6
14	Interlocks	Check for shorted, bent, or broken interlocks.	None.
15	Air filters	Inspect and clean the air filters. <u>a.</u> Use blowers to blow out dust. <u>Warning:</u> Compressed air is dangerous and can cause serious bodily harm. It can also cause mechanical damage to the equipment. <u>Do not</u> use compressed air to dry parts where cleaning compound has been used. <u>b.</u> Pour cleaning compound over the filter. Place a large basin under the filter to catch the compound.	Figs. 1, 6, 14, and 40

Sequence No.	Item	Procedure	References
15		<p>After the dirt particles settle, the clear liquid can be reused.</p> <p><u>Warning:</u> Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. <u>Do not</u> use near a flame.</p> <p><u>c.</u> Use a light water spray to flush out the loosened dirt.</p> <p><u>d.</u> After the filter is dry, spray light oil <u>very sparingly</u> on the side of the filter that faces the flow of air. To prevent oil from being spread throughout the equipment by air suction, avoid using excess oil.</p>	
16	Autotune	Check gears of the autotune mechanism for excessive wear.	None.
17	Transformers and chokes.	Check all transformers and chokes for evidence of overheating.	TM 11-5821-212-10, Figs 28, 29, and 30
18	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions.	TM 11-5821-212-10, app. II, and TM 11-5821-212-20P.
19	Equipment performance.	<p>Check for normal operation.</p> <p><u>Warning:</u> Dangerous voltages exist in this transmitting set. Read paragraph 23, before making checks.</p>	Par. 23
20	Lubrication	Check to determine the need for lubrication, and that there has been no excessive lubrication.	Par. 20

Page 20. Delete figure 11.

Page 62. Add appendix I after chapter 4:

APPENDIX I

REFERENCES

Following is a list of references applicable and available to the unit repairman of Transmitting Set, Radio AN/FRT-51:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders
TM 9-213	Painting Instructions for Field Use
TM 11-5821-212-10	Radio Transmitting Set AN/FRT-51, Operator's Manual
TM 11-5821-212-20P	Organizational Maintenance Repair Parts and Special Tools List Transmitting Set, Radio AN/FRT-51
TM 38-750	The Army Equipment Record System and Procedures

Page 63. Redesignate old "APPENDIX I" as: APPENDIX II.

Page 64. Redesignate old "APPENDIX II" as: APPENDIX III.

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

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Major General, United States Army,
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USATC Engr (2)
USATC Inf (2)
USATC Armor (2)
USASTC (5)
Instl (2) except
Ft Monmouth (65)
Svc Colleges (2)
Br Svc Sch (2) except
GENDEP (OS) (2)
Sig Dep (OS) (12)
Sig Sec, GENDEP (5)

Army Dep (2) except
Ft Worth (8)
Lexington (12)
Sacramento (28)
Tobyhanna (12)
USA Trans Tml Comd (1)
Army Tml (1)
USAOSA (1)
POE (1)
WRAMC (1)
AMS (1)
AFIP (1)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
USA Elct Mat Agcy (12)
Chicago Proc Dist (1)
USA Elct RD Actv, White Sands (13)
USA Elct RD Actv, Ft Huachuca (2)
USARSOUTHCOM Sig Agcy (1)
Sig Fld Maint Shop (3)
Units org under fol TOE:
Two copies each unit UNOINDC:
11-7
11-16
11-57
11-98
11-117
11-155
11-157
11-500 (AA-AE) (4)
11-557
11-587
11-592
11-597

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

TECHNICAL MANUAL
No. 11-5821-212-20

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DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 24 August 1959

RADIO TRANSMITTING SET AN/FRT-51

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CHAPTER 1

INTRODUCTION

1. Scope

a. These instructions are published for the use of personnel responsible for second echelon maintenance of Radio Transmitting Set AN/FRT-51. The operating instructions for this equipment are contained in TM 11-5821-212-10, Radio Transmitting Set AN/FRT-51, Operator's Manual.

b. Two appendixes are included in this manual:

Appendix I, Hook-up Wire Code.

Appendix II, Maintenance Allocation.

c. The repair parts and special tools list will be published as a separate technical manual.

d. Forward comments on this manual directly to Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

a. When preparing the preventive maintenance form, use DA Form 11-238, Maintenance Check List for Signal Equipment (Sound Equipment, Radio, Direction Finding, Radar, Carrier, Radiosonde and Television) (fig. 11) in accordance with instructions on the form.

b. For other applicable forms and records, see paragraph 2, TM 11-5821-212-10.

CHAPTER 2

INSTALLATION AND INITIAL ADJUSTMENTS

Section I. INSTALLATION

3. Siting

The distance range that can be obtained with the transmitting set largely depends on the selection of a suitable location for the antenna. Ground conductivity and height of surrounding terrain and obstructions should be carefully weighed before the final decision is made. Where possible, it is recommended that the transmitting and receiving functions be situated at widely separated locations to eliminate any possibility of interference. The selection of a site and design of the installation should be undertaken only by trained personnel.

4. Housing Requirements

The building that houses the transmitting set must meet the following requirements:

a. The floor must be capable of sustaining the weight of the equipment in a level position without vibration. Total weight of the equipment is approximately 4,580 pounds.

b. The floor space must measure at *least* 20 by 15 feet to provide room for efficient and convenient use of the equipment. This area includes space for the actual equipment with door swing allowance and sufficient space to allow for removal of units for servicing and for work by maintenance personnel around the equipment.

c. A ceiling height of at least 9 feet is necessary to allow for installation of radio-frequency (RF) transmission lines.

d. Adequate ventilation must be provided. Approximately 11.5 kilowatts (kw) of power are dissipated in the cooling air of the transmitting set; the hot air is exhausted from the ducts in the cabinet tops at the rate of 1,500 cubic feet per minute. Operation of the transmitting set in a poorly ventilated room will cause the surrounding temperature to become too high. Temperature and humidity control and filtering should be used where dust, humidity, or temperature is extreme.

5. Uncrating and Unpacking

a. *General.* The transmitting set may be shipped in overseas packing cases or in domestic packing cases. When a new transmitting set is received,

move it to its intended site *before* uncrating or unpacking.

b. *Step-by-step Instructions for Uncrating and Unpacking.* The entire transmitting set, including spare parts, is packed in wooden crates. The large cabinets are individually crated. All units are carefully braced in the crates to prevent damage due to shifting during shipment. Each of the large units is crated by placing it upright on a wooden base and securing the unit to the base with metal straps passed over the top of the unit and bolted to the wooden base at each end. The base is bolted to the bottom of the packing case and the rest of the case built around the unit. It is necessary to use a hoist or considerable manpower to move the crates into position. When unpacking the equipment, proceed as follows:

- (1) Place the packing case near the position where the equipment is to be installed.
- (2) Cut and remove the steel straps and reinforce the corners of the case.
- (3) Remove the nails with a nail puller.
- (4) Remove the top and sides of the packing case.

Caution: Prying off the sides or top of the case may result in damage to the equipment.

- (5) Remove the bags of desiccant which are distributed throughout the equipment to absorb moisture.
- (6) Remove the cabinet from its base and move it into position on the floor.
- (7) Many of the components within the large cabinets have been blocked in place with wooden supports, padding, or tape. Remove all packing material. Untie all components that have been bound in place with tape. The specific blocking and taping done during packing may vary in minor detail from unit to unit. It is important to check certain items in the group for evidence of blocking or taping as follows:

- (a) The blower assemblies located in the base of each cabinet are secured with reversible C blocks prior to shipment to prevent

shipping damage to the assemblies. Before placing the equipment in operation, release the blower assembly mounting bolts, remove the C blocks, turn them over, and replace. Tighten the bolts. The points of the C blocks must be pointing upward during operation, and serve as protection against blower vibration overtravel.

- (b) Delta-wye contactor K5601 (fig. 27), in the high-voltage (hv) power supply may have been taped or blocked prior to shipping. Check and untape or unblocked as necessary. If the equipment were energized with this assembly secured, it would be impossible to operate the equipment properly and serious damage to the contractor would result.
- (8) Carefully remove the smaller units from their packing cases, but do not install them

in their places until they have been thoroughly checked.

- (9) While visually inspecting the equipment for damage, check all the units and components received against the master packing list.

6. Air Intake and Cable Entry Provisions

a. *General.* Figure 1 shows the air intakes and cable entry provisions to the hv power supply chassis. The entries to the other two major chassis are similar. Each cabinet of the transmitting set is designed to permit a choice of air intake arrangements. There are three intake openings in each cabinet:

- (1) Louvered opening in door.
- (2) Opening at the base of the front.
- (3) The underside of the cabinet.

b. *Access Panel Adapter Plates* (fig. 2). Access panel adapter plates are supplied with each cabinet. The chart below describes the plates, their location when shipped, and lists their uses.

Letter designation	Number supplied per cabinet	Description	Location when shipped	Notes
A	1	Blank cover-----	Outside front access opening behind C (fig. 1).	May be used to close front or rear access opening.
B	2	Cable entrance or blank cover.	Outside rear access opening	Used in pairs. When shipped, they are installed to provide cable entry. Reverse one plate to make a blank cover. May be used on either front or rear access opening.
C	1	Intake grill-----	Outside front access opening in front of plate A.	Used to provide air intake through the front access opening.
D	2	Air-duct collars---	Inside front access opening behind plates A and C extending backward into cabinet.	Used in pairs to connect air ducts to either the front or rear access opening. The air-duct collars can be installed on either the front or rear access opening with collars facing out. Fasten duct to collars with clamps or by drilling and tapping collars.
E	1	Combination air exhaust screen and duct collar.	Top of cabinet over air exhaust opening, collar extending downward into cabinet.	To connect exhaust duct, reverse screen so that collar faces out. Fasten duct with clamps or by drilling and tapping collar.

c. *Air Intake through Front of Cabinet* (fig. 1 and 2).

- (1) Remove blank plate A and install air-duct collar D as described in the chart (b above).
- (2) There should be no plate covering the louvers on the inner surface of the front panel. If a plate is there, remove it.
- (3) Insert remaining plates as required.

d. *Air Intake from Beneath Cabinet* (fig. 1 and 2).

Use this arrangement if the ventilating air is drawn through a suitable grill in the floor directly beneath the cabinets.

- (1) Fasten blank plate A in place of intake grill C over the opening at the base.
- (2) Fasten a plate over the frame that borders the louvers on the inner surface of the front panel.
- (3) Insert the remaining plates as required.

7. Installation Procedure

- a. Choose a location for the equipment that meets the space and air intake requirements listed in paragraph 4.
- b. Locate and drill twelve 3/4-inch mounting holes in the floor or mounting surface. Figure 3 shows location and spacing of these holes.
- c. Use the 5/8- by 8-inch bolts provided with the equipment to bolt the three major cabinets securely to the floor or mounting surface.
- d. Bolt the large cabinets together as illustrated in detail A, figure 3.
- e. The dummy antenna mounting bolt hole locations and the remote control unit installation details are illustrated in figure 3.

8. Interunit Connections

- (fig. 4, 5, and 6)
- a. The units of the transmitting set are interconnected by power, control, and signal lines contained

in fabricated cables furnished with the equipment. To interconnect the RF amplifier with the hv power supply and dummy load, connect the wires of the fabricated cables to the terminals as shown in figure 4 and 6. To interconnect the modulator-oscillator to the remote control unit and FR amplifier, make the connections shown in figure 5.

Note. Terminal board TB5505 (fig. 14) is accessible after removing the base of the air duct from the top of the blower assembly and pushing the duct aside. The base of the duct is removed by taking out the two sheet metal screws that secure it to the blower assembly top duct. One is located in the center front of the duct bracket, the other in the center rear of the duct bracket.

- b. The characteristics of the hook-up wire shown in figure 4 are represented by groups of symbols. Each symbol group consists of a maximum of three letters followed by a maximum of three numerals. When three letters are used, the first indicates the type of wire, the second represents the size of wire, and the third is the letter S, used only when the

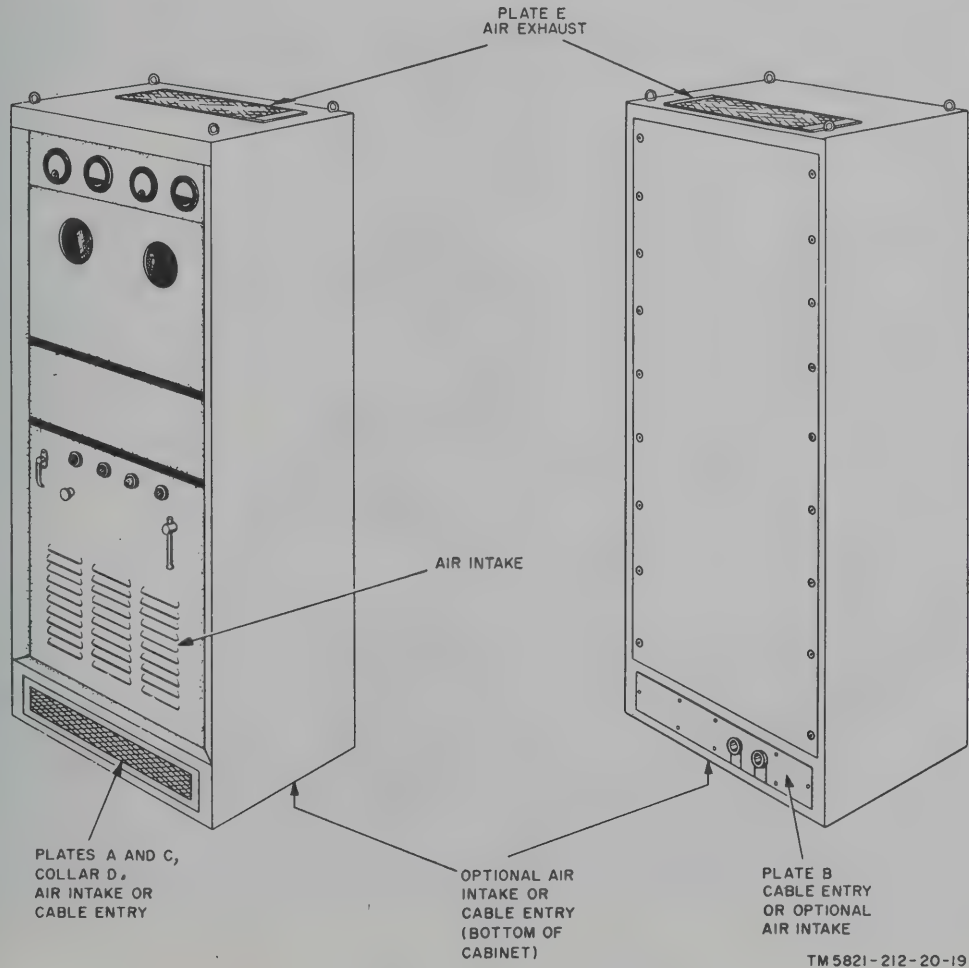


Figure 1. Air intake and cable entry arrangements.

wire is shielded. The use of two letters indicates either the type and size of wire or the size of wire and shielding. The use of one letter indicates the wire size only. The first numeral indicates the color of the wire body and the second and third numerals, if any, represent the colors of the tracers. All numerals are in accordance with the standard RMA and JAN C76 color code. The color code is shown in appendix I.

c. To use the dummy antenna, connect a coaxial cable consisting of J5101, P7051, and a 25-foot length of RG-17A/U between P5101 and J7501 (fig. 4 and 7). Connect the RF amplifier plate tank output to RF OUTPUT 52 OHMS jack J5101 by positioning the metal strap as indicated in detail B, figures 3 and 7. Remove the jumper from terminals 8 and 9 of TB5503 (fig. 4).

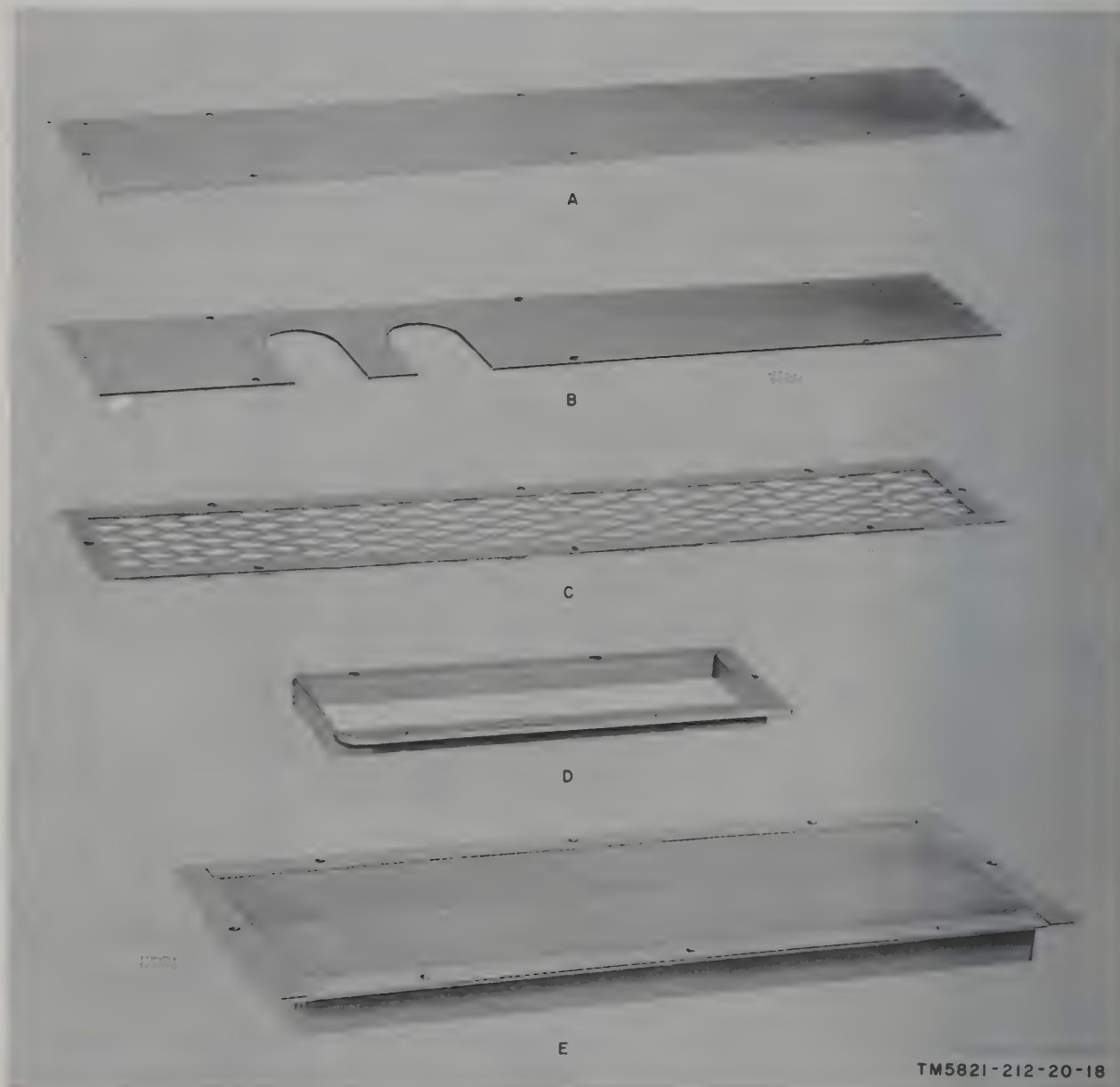
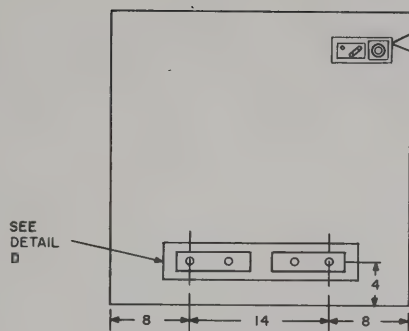
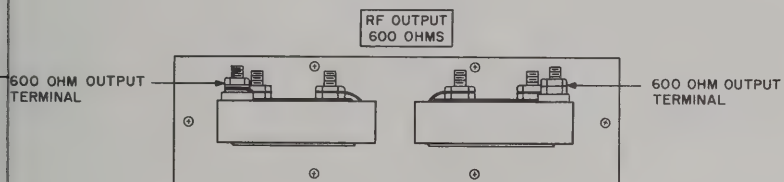
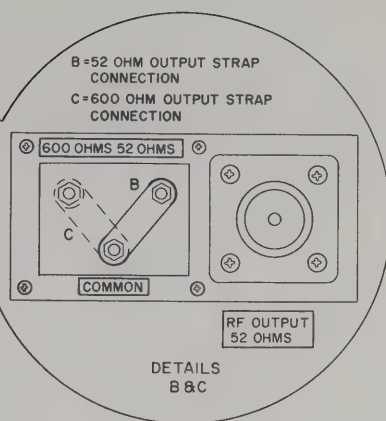


Figure 2. Access panel adapter plates.



OUTPUT CONNECTION LOCATIONS,
TOP RF AMPLIFIER CABINET

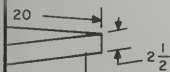


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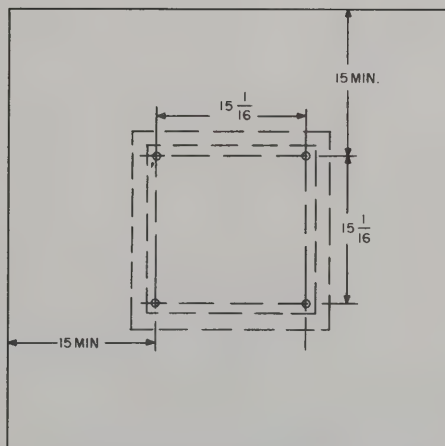
1637A/GR



7



A



DUMMY ANTENNA MOUNTING BOLT HOLE LOCATIONS
AND MINIMUM FLOOR SPACE REQUIREMENTS.

wire is shielded. The use of two letters indicates either the type and size of wire or the size of wire and shielding. The use of one letter indicates the wire size only. The first numeral indicates the color of the wire body and the second and third numerals, if any, represent the colors of the tracers. All numerals are in accordance with the standard RMA and JAN C76 color code. The color code is shown in appendix I.

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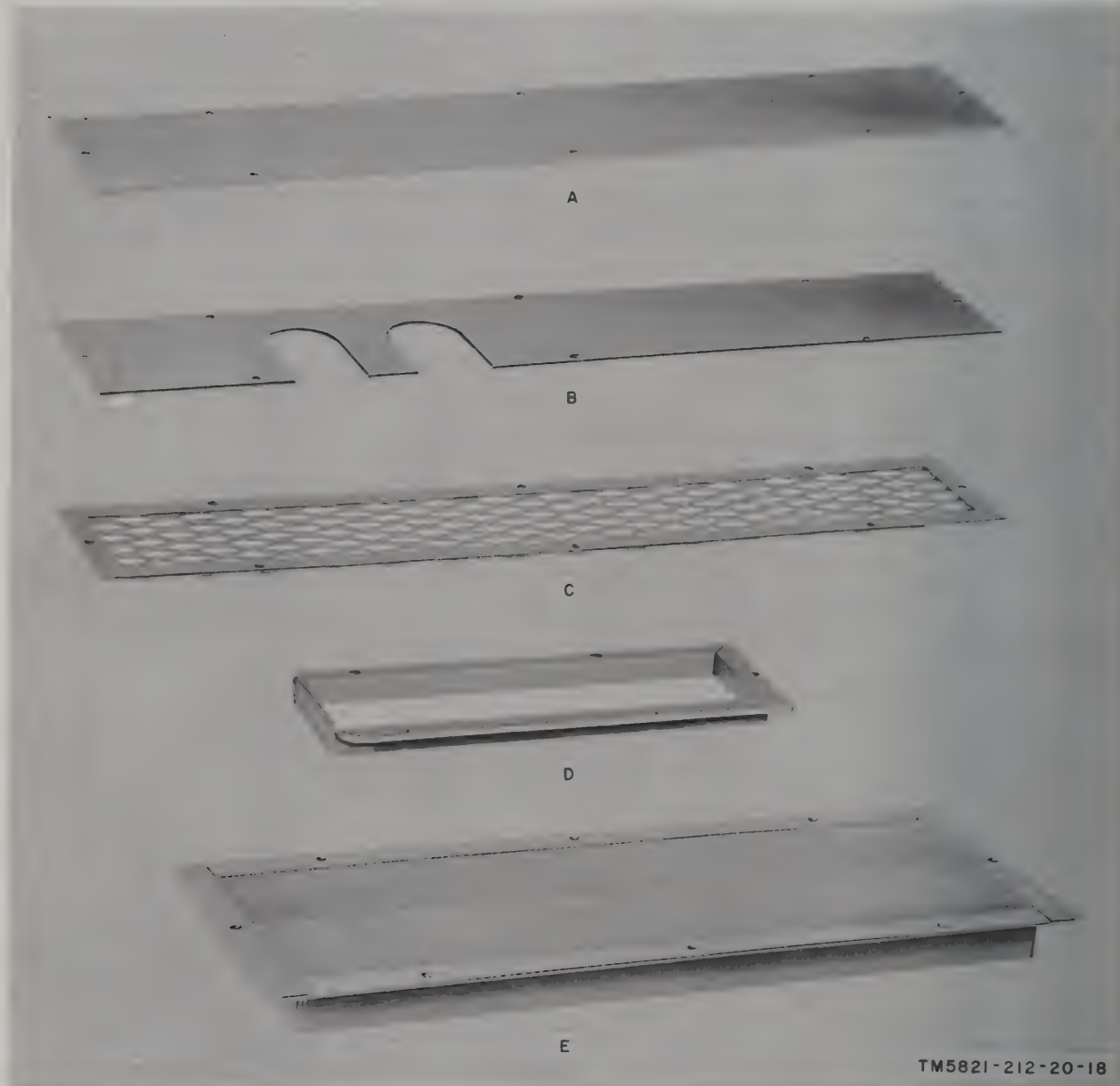
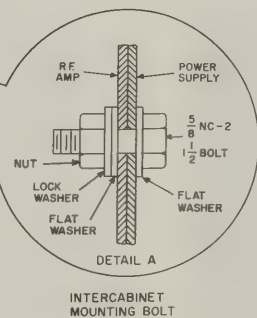
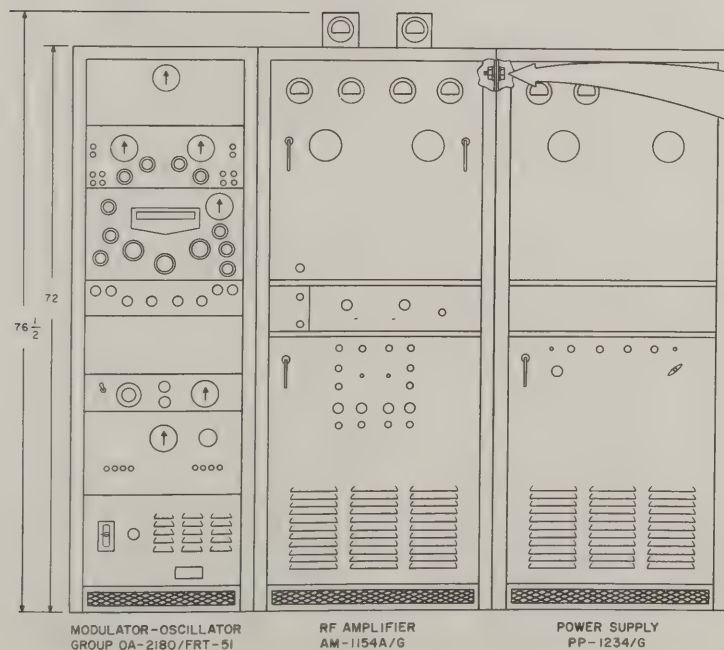
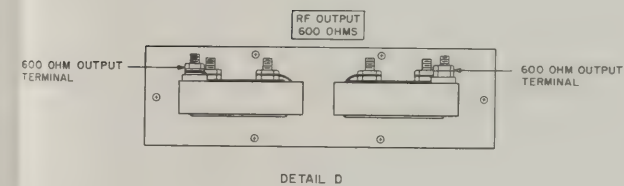
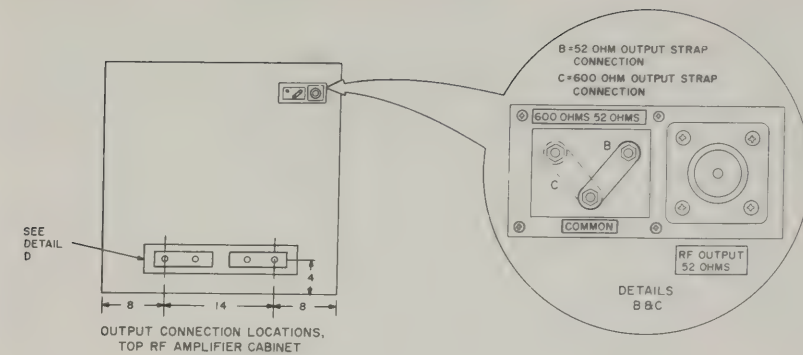
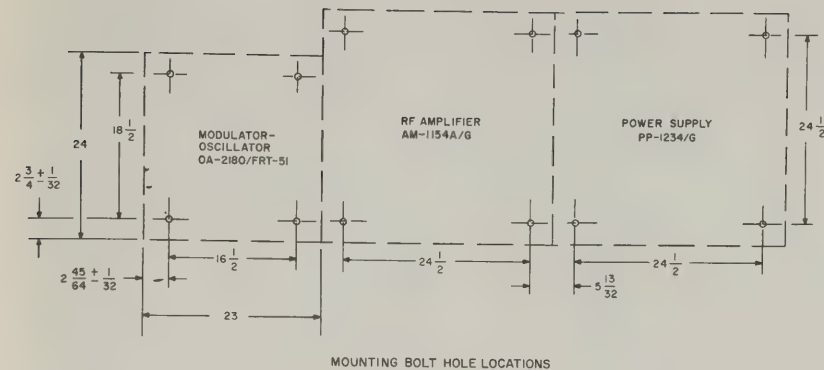
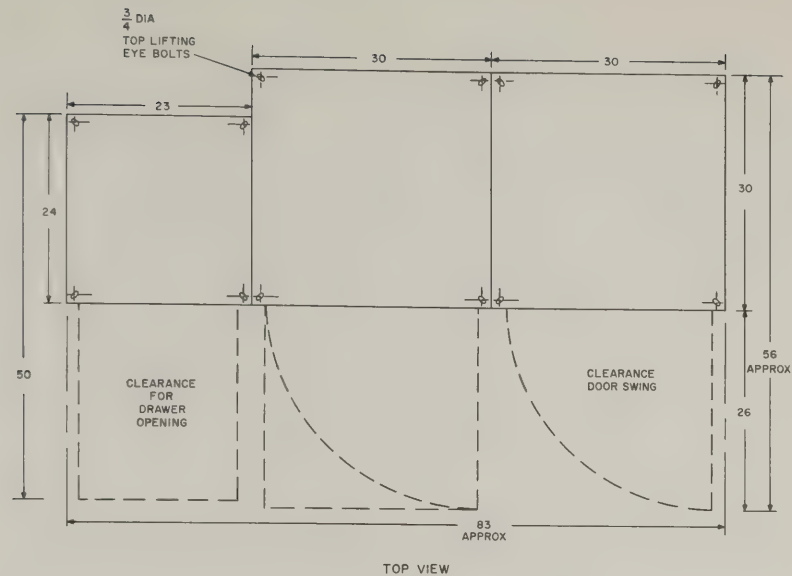


Figure 2. Access panel adapter plates.



- NOTES:
1. UNLESS OTHERWISE INDICATED ALL DIMENSIONS ARE GIVEN IN INCHES.
 2. AMPLIFIER CONTROL C-1637A/GR MAY BE MOUNTED IN A STANDARD 19 INCH RACK IF DESIRED. THE MOUNTING BOX MUST BE REMOVED. ALLOW 10-1/2 INCH PANEL SPACE.

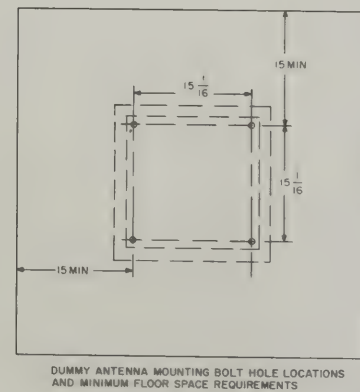
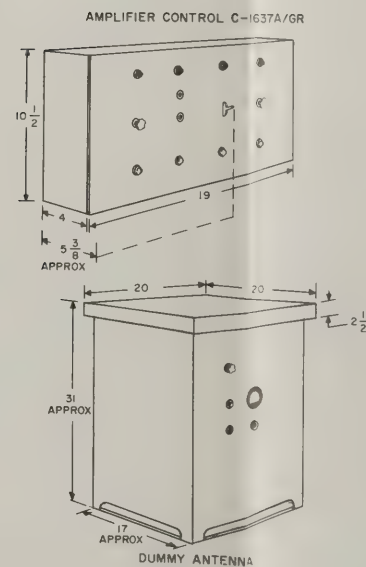
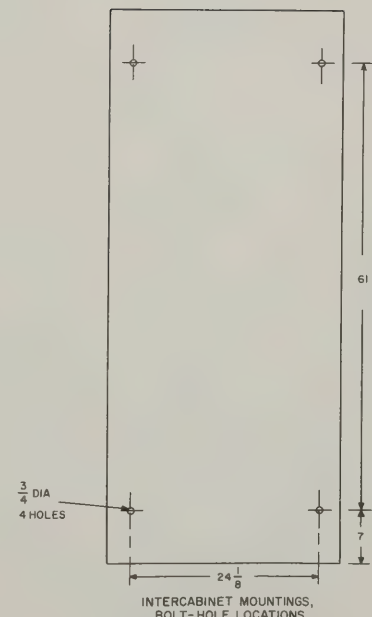


Figure 3. Installation diagram.

d. The following chart lists the connecting cables supplied with the transmitting set.

Connection		Function	No. of wires
From	To		
Radio Frequency Amplifier AM-1154A/G.	Power Supply PP-1234/G	Power and control	34
Modulator-Oscillator Group OA-2180/FRT-51.	Control Amplifier C-1637A/GR.	Control	22
E5607	E5501	Power	Coaxial Cable RG-64A/U
E5606	E5607	Power	Metal link
Radio Frequency Amplifier AM-1154A/G.	Electrical Dummy Load DA-212/FRT-51.	Power and control	4 (red, green, white and black wires)
Radio Frequency Amplifier AM-1154A/G.	Electrical Dummy Load DA-212/FRT-51.	Rf power	Coaxial cable RG-17A/U
Radio Frequency Amplifier AM-1154A/G.	Modulator-Oscillator Group OA-2180/FRT-51.	Power and control	28
Radio Frequency Amplifier AM-1154A/G.	Modulator-Oscillator Group OA-2180/FRT-51.	Rf power input	Coaxial cable RG-58/U
Radio Frequency Amplifier AM-1154A/G.	Modulator-Oscillator Group OA-2180/FRT-51.	Rf sampling	Coaxial cable RG-58/U
Power Supply PP-1234/G	Power source	Power	4

9. Cable Connector Fabrication

When the transmitting set is initially shipped by the manufacturer the coaxial cables listed in paragraph 8d are completely assembled. The instructions for cable connector fabrication in figures 8 through 10 are for repairing or assembling new cables. Figure 8 contains the assembly instructions for connecting a UG-154/U connector to an RG-17A/U coaxial cable or similar type coaxial transmission line. Figures 9 and 10 are the assembly instructions for connecting two different types of BNC connectors to an RG-58/U or similar type coaxial transmission line.

10. Installation of Tubes

The tubes in the RF amplifier and the hv power supply are removed prior to shipment. Use the information given in *a* and *b* below to install the tubes.

a. Hv Power Supply.

Reference symbol	Function	Tube type	Figure No.
V5601	Hv rectifier	4B32	28
V5602	Hv rectifier	4B32	28
V5603	Hv rectifier	4B32	28
V5604	Hv rectifier	4B32	28
V5605	Hv rectifier	4B32	28
V5606	Hv rectifier	4B32	28
V5607	Buffer plate rectifier	3B28	29
V5608	Buffer plate rectifier	3B28	29
V5609	Low voltage rectifier	5R4WGY	29
V5701	Pa screen rectifier	3B28	29
V5702	Pa screen rectifier	3B28	29

b. RF Amplifier.

Reference symbol	Function	Tube type	Figure No.
V2902	Buffer	4CX250B	33
V2903	Driver	4CX250B	33
V5001	FR power amplifier	4-1000A	31
V5002	RF power amplifier	4-1000A	31
V5003	RF power amplifier	4-1000A	31
V2901	Input RF amplifier	6AH6WA	33
V3101	Servo amplifier	5751	33
V3102	Servo amplifier	5814A	33
V3103	Servo power amplifier	5814A	33
V3104	Servo amplifier	5751	33
V3105	Servo power amplifier	5814A	33
V5004	Alc rectifier	5726/6AL5W	31
V5201	Servo amplifier	5814A	32
V5202	Servo amplifier	5751	32
V5203	Tuning servo motor control	6012	30
V5204	Tuning servo motor control	6012	30
V5301	Servo amplifier	5751	32
V5302	Loading servo motor control	6012	30
V5303	Loading servo motor control	6012	30
V5801	Bias rectifier	5R4WGY	30
V5802	Bias regulator	6AS7G	30
V5803	Voltage regulator	OA3	30
V5804	DC amplifier	6AV6	30
V5805	Bias regulator	6AS7G	30
V7301	Tuning sequence controller	12AT7WA	32

11. Primary Power Connections

Use the power input cable to connect 220-volt, 60-cycle power from the station distribution panel to terminal board TB6005 (fig. 4, 6, and 40) in the hv power supply.

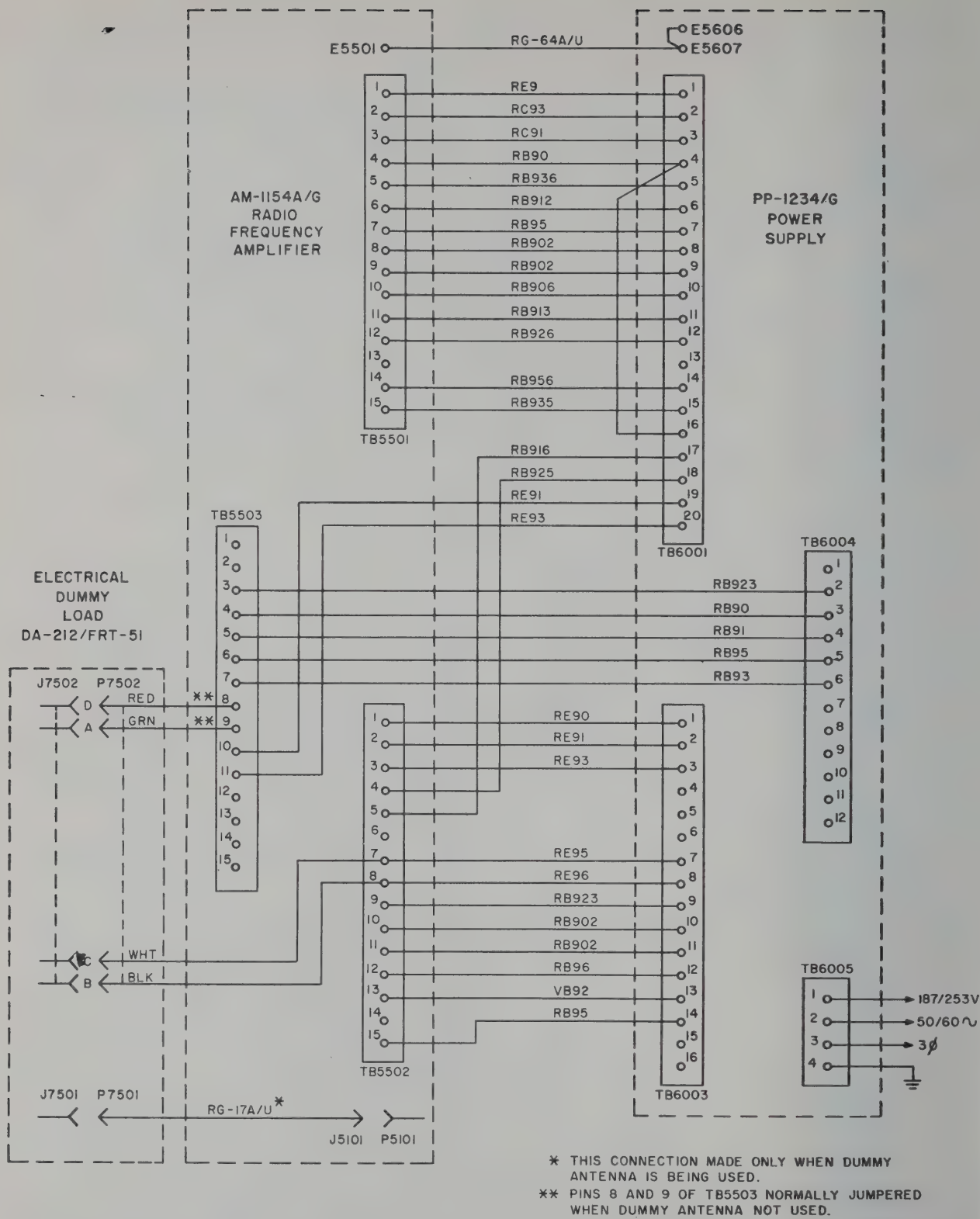


Figure 4. RF amplifier, hv power supply, and dummy antenna, interconnections diagram.



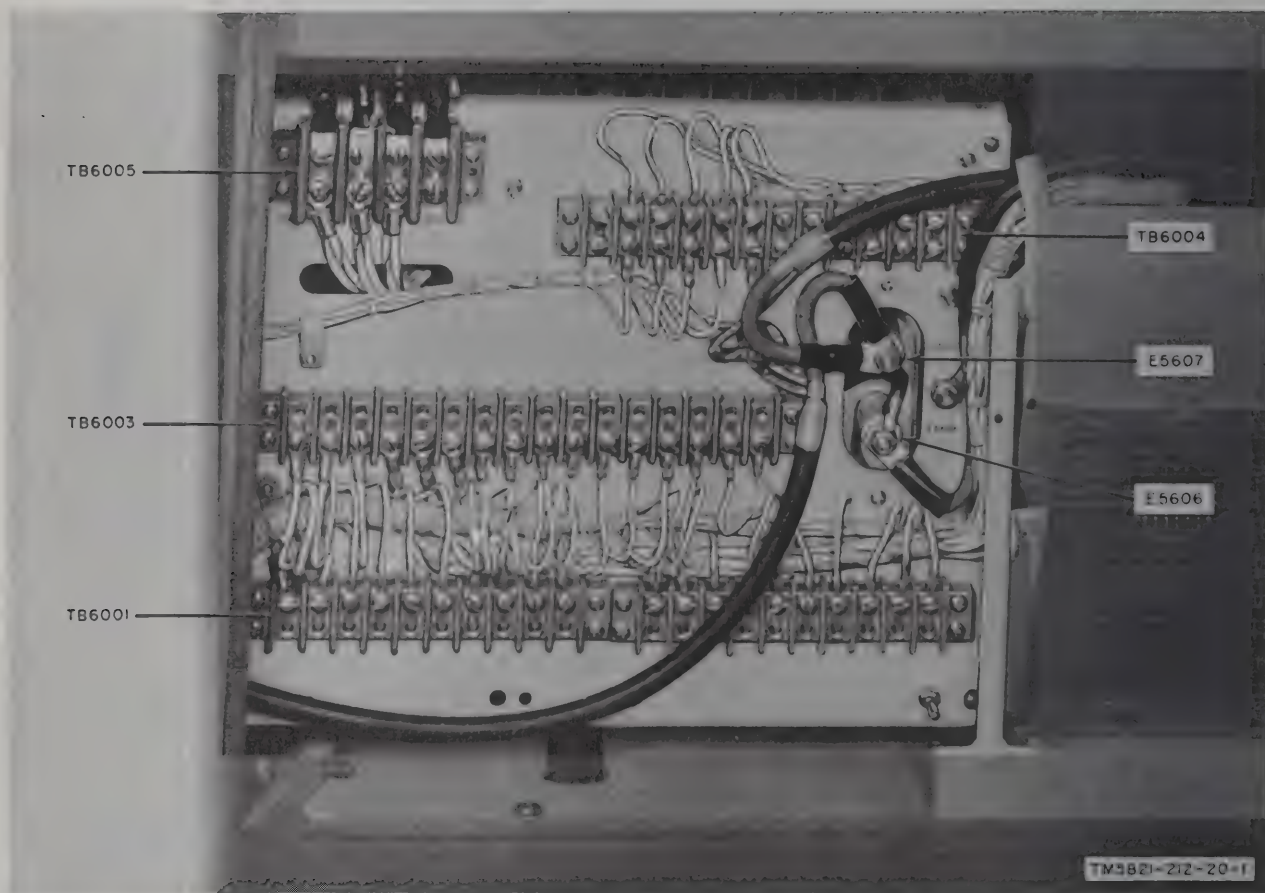
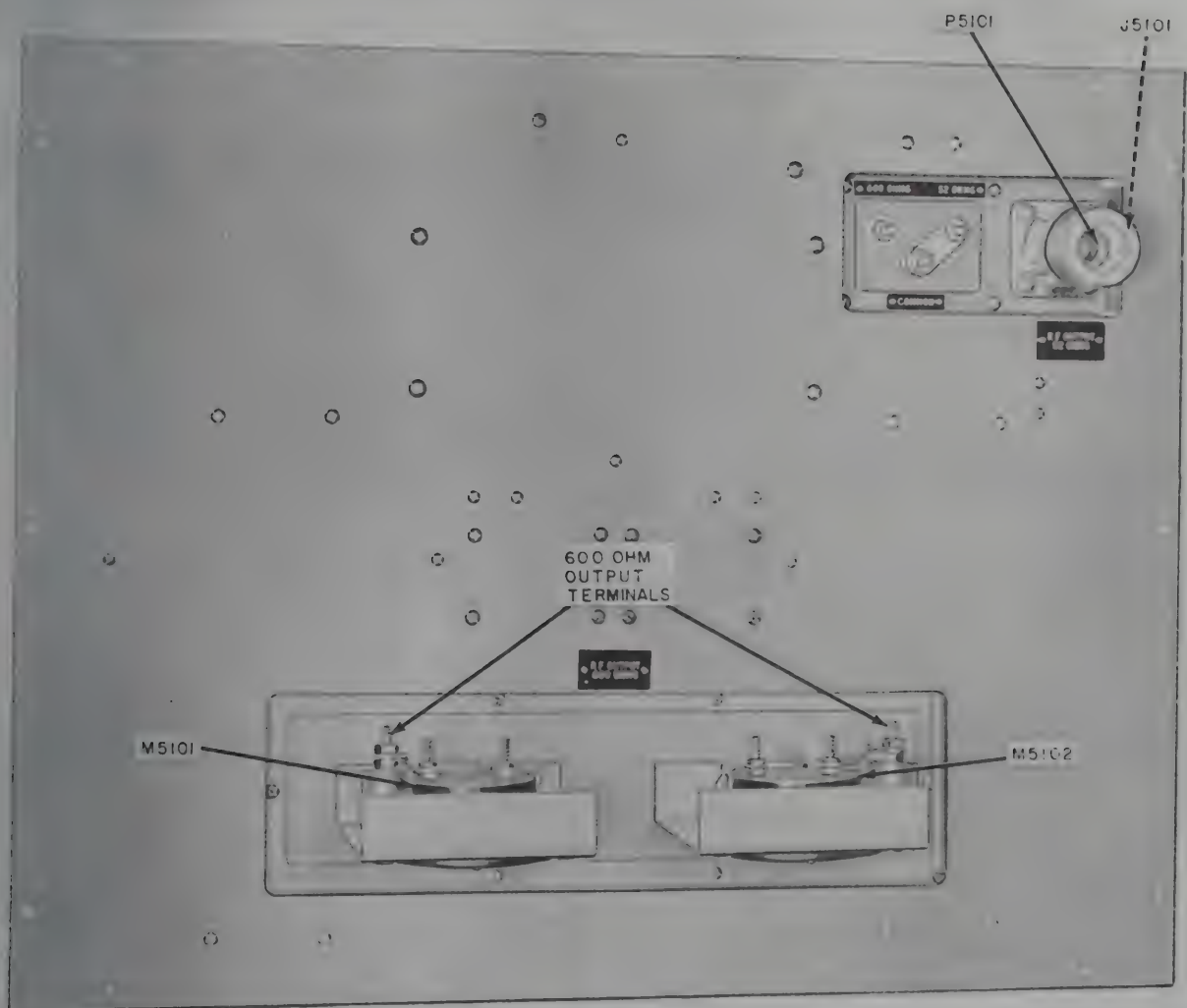
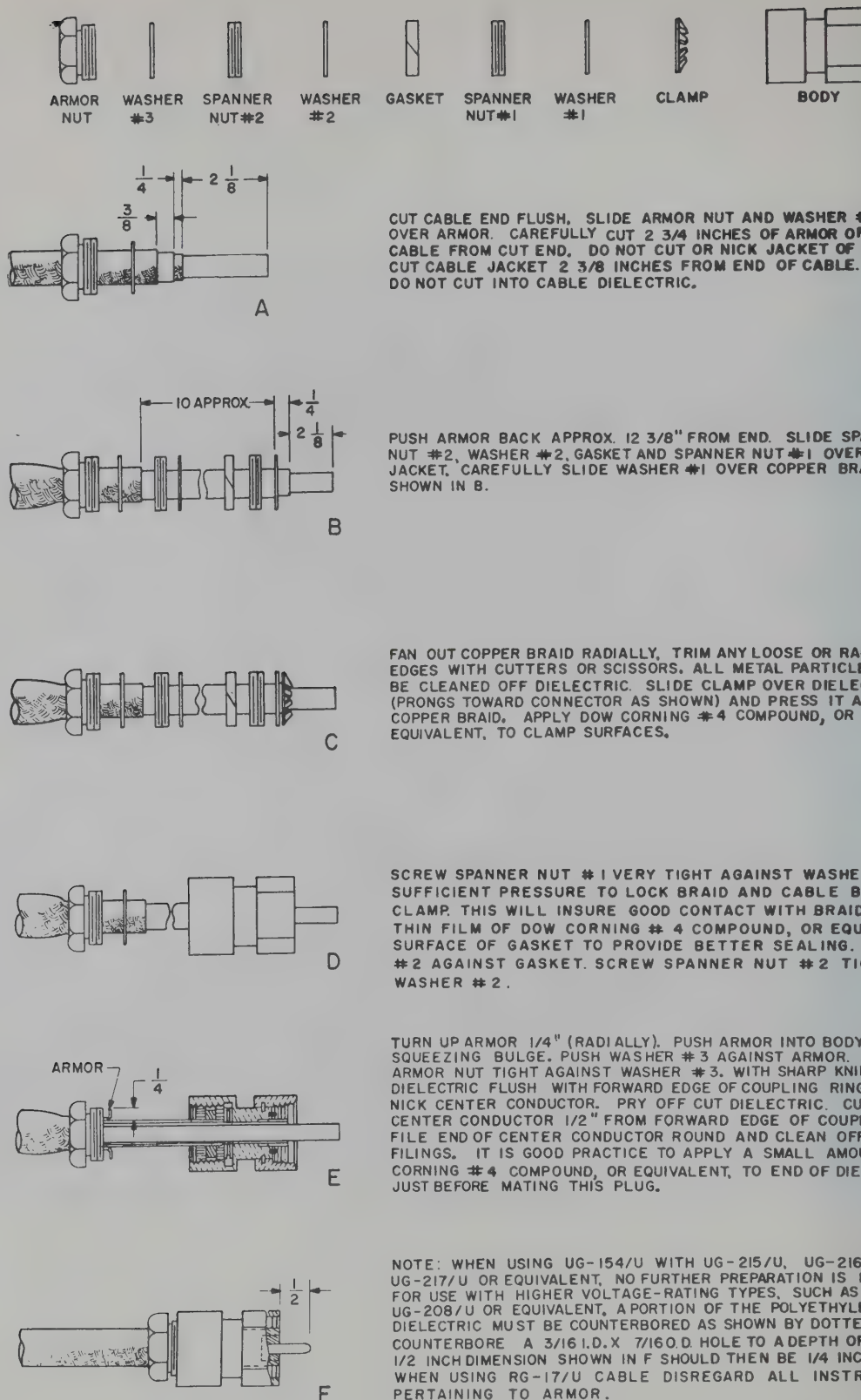


Figure 6. Hv power supply terminal boards.



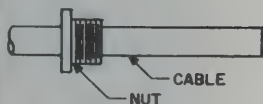
TM5821-212-20-28

Figure 7. RF amplifier, output connections.

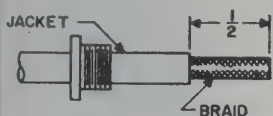


TM5821-212-20-23

Figure 8. Assembly instructions for UG-154/U connector.



CUT END OF CABLE EVEN.



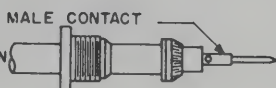
REMOVE VINYL JACKET 1/2"
DON'T NICK BRAID.



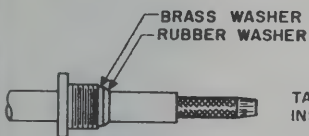
BARE CENTER CONDUCTOR 1/8"
DON'T NICK CONDUCTOR.



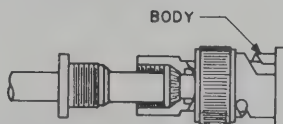
PUSH BRAID BACK AND
REMOVE 1/8" OF INSULATION
AND CONDUCTOR.



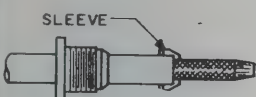
TIN CENTER CONDUCTOR OF CABLE. SLIP
MALE CONTACT IN PLACE AND SOLDER.
REMOVE EXCESS SOLDER BE SURE CABLE
DIELECTRIC IS NOT HEATED EXCESSIVELY
AND SWOLLEN SO AS TO PREVENT DIELECTRIC
ENTERING BODY.



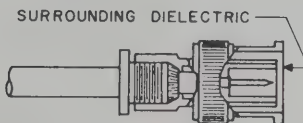
TAPER BRAID AND
INSTALL WASHERS.



PUSH INTO BODY AS FAR AS IT WILL GO.
SLIDE NUT INTO BODY AND SCREW INTO
PLACE WITH WRENCH UNTIL MODERATELY
TIGHT. HOLD CABLE AND SHELL RIGIDLY
AND ROTATE NUT.



SLIDE SLEEVE OVER
TAPERED BRAID. FIT
INNER SHOULDER OF
SLEEVE SQUARELY
AGAINST END OF JACKET.



END OF MALE CONTACT SHALL BE FLUSH
WITH END OF SURROUNDING DIELECTRIC.
(TOLERANCE $\pm 1/32"$)

FINAL ASSEMBLY SHOWN IN SECTION



WITH SLEEVE IN PLACE, COMB OUT
BRAID, FOLD BACK SMOOTH AS SHOWN,
AND TRIM 3/32".

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Figure 9. Assembly instructions for type BNC male connector.

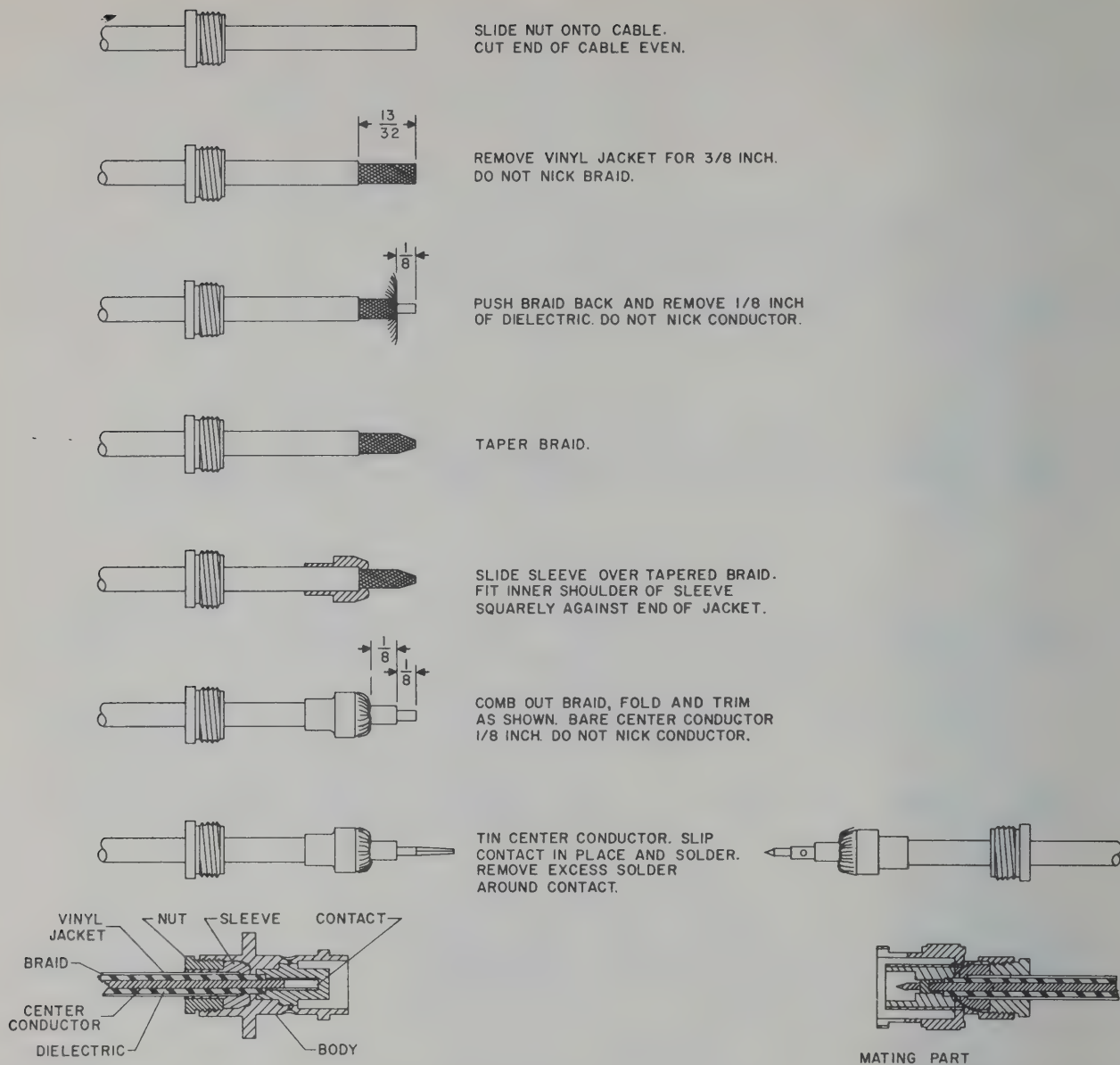


Figure 10. Assembly instructions for type BNC female connector.

12. Output Connections

a. 52-ohm Unbalanced Output. Connect the RF amplifier plate tank output to RF OUTPUT 52 OHMS jack J5101 (fig. 7) by positioning the metal strap as indicated in detail B, figure 3. Connect plug P5101 to RF OUTPUT 52 OHMS jack J5101.

b. 600-ohm Balanced Output. Connect the RF amplifier plate tank output to the transmission line coupler by positioning the metal strap as indicated in detail C, figure 3. Connect the 600-ohm transmission lines to the two 600-ohm output terminals (fig. 7).

Section II. INITIAL ADJUSTMENTS

13. General

Personnel performing these procedures should be familiar with the use of controls and instruments and

with the operating procedures described in TM 11-5821-212-10.

14. Tools Required for Initial Adjustments

The following tools are required for making the initial adjustments on the transmitting set:

- a. Tool Equipment TE-113.
- b. Set of feeler gages including .003-inch and .005-inch sizes.

15. Hv Power Supply Initial Adjustments

a. *Hv Power Supply Spark Gaps.* Adjust the spark gaps (fig. 27) so that a .003-inch feeler gage *will*, and a .005-inch feeler gage *will not*, pass through them.

b. *Line Phasing Adjustment.* Check the 220-volt input line phasing as follows:

- (1) Remove the air filter from the RF amplifier.
- (2) Press the RF amplifier STANDBY ON switch.
- (3) Wait 10 seconds.
- (4) Press the RF amplifier STANDBY OFF switch and quickly observe the direction of rotation of the RF amplifier blower fan as it drifts to a stop. The fan is observed through the air duct directly behind the air filter position.
- (5) If the fan rotates clockwise, the line phasing is correct. If the fan rotates counter-clockwise, the line phasing is incorrect.
- (6) If the line phasing is incorrect, shut off the primary input power at the source and reverse the connections to terminals 1 and 2 on TB6005 (fig. 4 and 6) in the hv power supply or at the station distribution board.
- (7) When the line phasing is correct, replace the air filter.

16. Modulator-Oscillator Initial Adjustments

Note. Refer to TM 11-5821-212-10 for location of controls and meters.

a. *Preliminary Voltage Checks.* The preliminary voltage checks insure that all the major units within the modulator-oscillator group are supplied correct operating voltages. If those voltages are not obtained, refer to the equipment performance check list (par. 23).

- (1) Operate the LINE SWITCH to ON. Observe that the LINE indicator on the power supply control panel glows.
- (2) Set the AUTOMATIC-MANUAL switch on the automatic line voltage control panel to AUTOMATIC.
- (3) Set the SENSITIVITY control on the automatic line voltage control panel to the clockwise stop.

- (4) Set the VOLTAGE control to obtain 115 volts alternating current (ac) as indicated on the LINE VOLTAGE meter.

Note. If minor voltage fluctuations cause excessive hunting in the automatic line voltage control, reduce the SENSITIVITY control until the LINE VOLTAGE meter needle remains stationary.

- (5) Operate the meter switch on the power supply to the +300V FREQ. STD. and +150V FREQ. STD. positions to check the frequency standard supply voltages. Observe that the meter pointer rests in the green band (approximately 10) in both positions.
- (6) Press the FILAMENT ON button on the power supply control panel. Note that the blower starts and that the green FILAMENT indicator lights.
- (7) Operate the power supply meter switch to the +28V MOTOR, +28V RELAY, and -150V BIAS positions. Observe that the meter indicates in the green band (approximately 10) for each position.
- (8) Press the PLATE ON button of the power supply control panel. Note that the red PLATE indicator lights.
- (9) Operate the power supply meter switch to the +300V EXCITER position. Observe that the meter indicates in the green band (approximately 10).
- (10) Operate the power supply meter switch to the +125V EXCITER position, and adjust R2332 (fig. 36) if necessary to obtain a reading of 10 on the panel meter.
- (11) Operate the power supply meter switch to the +210V EXCITER position, and adjust R2335 (fig. 36) if necessary to obtain a reading of 10 on the panel meter.

b. *Setting 100-kc and 250-kc Levels.*

- (1) Set the METER switch of the frequency standard to position 6. Unscrew the cap covering the 100 KC LEVEL adjustment control, and use a screw driver to set the control for a meter reading of one-half full scale.
- (2) Operate the METER switch of the frequency standard to position 7. Set the 250 KC LEVEL adjustment control for a meter reading of one-half full scale.

c. *Presetting Autotune System.* The chart in (9) below shows settings at the high and low frequency

ends of each band to provide check points for subsequent frequency and output reading.

- (1) Tighten the three autotune locking keys on the exciter monitor front panel.

Caution: To prevent loss of channel settings, be sure that the winged locking keys for the FREQ-KC, FREQ-MC, and BAND controls are tightened before pressing the FILAMENT ON button of the power supply control panel, switching the REMOTE-LOCAL control, or before switching the CHANNEL selector on the exciter monitor.

- (2) Set the REMOTE-LOCAL switch on the exciter monitor front panel to LOCAL.
- (3) Press the FILAMENT ON button on the power supply control panel.
- (4) Set the CHANNEL selector switch on the exciter monitor to position 1 for the first setting shown in the chart below.
- (5) After the autotune motor stops, loosen the locking keys for the FREQ-MC, FREQ-KC, and BAND controls.
- (6) Rotate the BAND control to position 1.
- (7) Rotate the FREQ-MC and FREQ-KC controls to obtain a reading of 1,700.5 kilocycles (kc).
- (8) Tighten the locking keys for the FREQ-MC, FREQ-KC, and BAND controls.
- (9) Set the CHANNEL selector to position 2. After the autotune mechanism stops, perform steps (5) through (8) above to set up 2,299.5 kc on channel 2. Repeat this procedure to preset the remaining channels (3 through 10) as listed in the chart below.

Channel	Band	Freq-Mc	Freq-Kc
1	1	1.7	00.5
2	1	2.2	99.5
3	2	2.3	00.0
4	2	4.3	00.0
5	3	4.3	50.0
6	3	8.2	50.0
7	4	8.3	00.0
8	4	16.2	99.5
9	5	16.3	00.0
10	5	30.0	00.0

- (10) Press the PLATE ON button, set the CHANNEL selector to each position, and see that the autotune tunes the exciter-monitor to the dial settings listed in the chart and that the STABILIZED indicator lights at each dial setting.

d. Adjustment of 1-mc Crystal Oscillator. After the LINE SWITCH (fig. 7, TM 11-5821-212-20) has been on for at least 24 hours, use the procedure listed below to check the RF output frequency of the modulator-oscillator against WWV or against a primary frequency standard which has a accuracy of 1 part in 10 million, or better.

- (1) Set the 0.5 KC LOCK on the exciter monitor switch to ON.
- (2) Connect a 50-ohm, 1-watt resistor between RF output jack J3809 (fig. 39) and ground. Couple the RF output through a .05-microfarad 600-volt capacitor to a communications receiver. If this coupling provides a greater input to the receiver than that supplied by WWV or a primary frequency standard, use a resistor of lower value.
- (3) Tune the receiver to the 10-megacycle (mc) output frequency of WWV and compare it with the 10th harmonic of the 1-mc crystal oscillator. Observe the movement of the pointer on the S-meter of the receiver. Remove the LOCK cap on the frequency standard unit, and loosen the locking screw that prevents the 1-mc trimmer capacitor from turning. Remove the TRIM cap, and adjust the trimmer capacitor for zero beat on the carrier level meter. (S-meter should dip sharply when zero beat is obtained.) The accuracy of the 1-mc oscillator is determined by the accuracy of the frequency standard to which it is compared and the care with which the oscillator is adjusted. The 1-mc crystal oscillator is capable of maintaining an accuracy of 1 part in 100 million per day. Tighten the locking screw after the oscillator trimmer has been adjusted, and replace the caps.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. MAINTENANCE

17. Scope of Organizational Maintenance

a. Following is a list of maintenance duties performed by the organizational repairman. The scope of these instruction has been determined by the available tools, materials, spare parts, and the MOS of the repairman.

b. Organizational maintenance consists of the following:

- (1) Preventive maintenance (par. 19).
- (2) Lubrication (par. 20).
- (3) Visual inspection (par. 22).
- (4) Tube replacement (par. 24).
- (5) Equipment performance checklist (par. 23).

18. Tools and Materials Required

The tools required for organizational maintenance are similar to those used for initial adjustments (par. 14). The required materials are listed below:

- a. Cleaning Compound (FSN 7930-395-9542).
- b. Lubricating Oil, General Purpose (OGP).
- c. Grease, Aircraft and Instrument (GL).
- d. Lubricating Oils, Colloidal Graphite (LCG-a).
- e. Thinner, Paint, Mineral Spirits (TPM-1) (TT-T-299).
- f. Grease, Ball and Roller Bearing (BR).
- g. Graphite, Lubricating (FG).
- h. Bleached cheesecloth, lint free.
- i. Sandpaper #0000.

19. Preventive Maintenance Form

a. *DA Form 11-238*. DA Form 11-238 (fig. 11) is a preventive maintenance checklist to be used by the operator and the organizational repairman. Figure 11 shows the form as used by the organizational repairman. Reference in the item blocks are to paragraphs that contain additional maintenance information. Items not applicable to the transmitting set are lined out. Instructions for use appear on the form.

b. *Items*. The information shown in this subparagraph is supplementary to DA Form 11-238. The item numbers correspond to item numbers on the form.

Item	Maintenance procedure
11	Clean air filters once every 3 months as follows: <ol style="list-style-type: none">a. Use blowers to blow out dust.b. Pour Cleaning Compound over the filter. Place a large basin under the filter to catch the compound. After the dirt particles settle, the clear liquid can be re-used.c. Use a light water spray to flush out the loosened dirt.d. After the filter is dry, spray light oil <i>very sparingly</i> on the side of the filter that faces the flow of air. To prevent oil from being spread throughout the equipment by air suction avoid using excess oil.
17	Inspect vacuum capacitors for loose envelopes, loose clamps, and fittings. Be careful not to strike the seal-off tip on the envelope.
19	Check gears of the autotune mechanism for excessive wear.

Warning: Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

20. Lubrication

a. *General*. Lubrication data for the transmitting set is contained in the lubrication chart (c below) and figures 12 through 27. The lubrication charts (d below) are divided into two sections. The first section indicates lubrication procedures to be followed after each 1,000 hours of operation. The second section indicates lubrication procedures to be followed once each year, regardless of operating time. Letter designations on the charts and illustrations specify the type of lubricant and general manner of lubrication for each part. Additional lubrication instructions and the key to the letter designations are listed in c below.

b. *Autotune Mechanism*. Lubrication of the exciter monitor autotune mechanism and the autotune heads is performed semiannually by higher echelon repairmen.

c. Lubricants.

Letter designation	Type of lubricant	Special instructions
A	Oil (OGP)	(1) <i>Bearings.</i> Apply only as much oil as is required to fill the bearing. Wipe off any excess oil that remains on the outside of the bearing or on surrounding parts. If a bearing is dirty, clean it with Cleaning Compound and relubricate. (2) <i>Other components.</i> Apply only as much oil as is required for adequate lubrication. Wipe off any excess oil that remains. If the component is dirty, clean it with Cleaning Compound and relubricate.
B	Grease (GL)	(1) <i>Gears.</i> Apply a thin, even film of grease to the tooth faces only. When necessary, clean with Cleaning Compound and relubricate. (2) <i>Chains.</i> Apply a thin, even film of grease to the entire chain. When necessary, clean the chain with Cleaning Compound and relubricate. (3) <i>Sliding surfaces.</i> Apply a thin, even film of grease to the entire sliding surface. When necessary, clean the surface and sliding components with Cleaning Compound and relubricate. (4) <i>Other components.</i> Apply a thin, even film of grease to the component. When necessary, clean the component with Cleaning Compound.
C	Graphite (FG)	<i>Lubrication holes.</i> Fill the indicated holes with the graphite powder. Do not allow any graphite to remain on surrounding surfaces.
D	Grease (BR)	<i>Rollers and electrical surfaces.</i> Apply a thin, even coat to the contact surfaces only. When necessary, clean with thinner (TPM-1) and relubricate.
E	Oil (LCG-A)	<i>Roller track.</i> Apply a thin, even coat to the surfaces only. When necessary clean with thinner (TPM-1) and relubricate. Caution: Do not spray graphite lubricants, apply with brush or cloth.

Warning: Do not use galoline or carbon tetrachloride as cleaning fluids for any purpose.

d. Lubrication Charts.

(1) *Lubrication procedures after each 1,000 hours of operation.*

Item	Type of lubricant	Additional instructions	Figure No.
Tank coil rollers (2)-----	D		12
Tank coil roller track-----	E		12
Tank coil end-cap-----	E	Remove nuts from support bracket. Remove cap-----	12
Output coil roller shaft-----	D	Do not lubricate contact surface of roller-----	13

(2) *Lubrication procedures after each year of operation.*

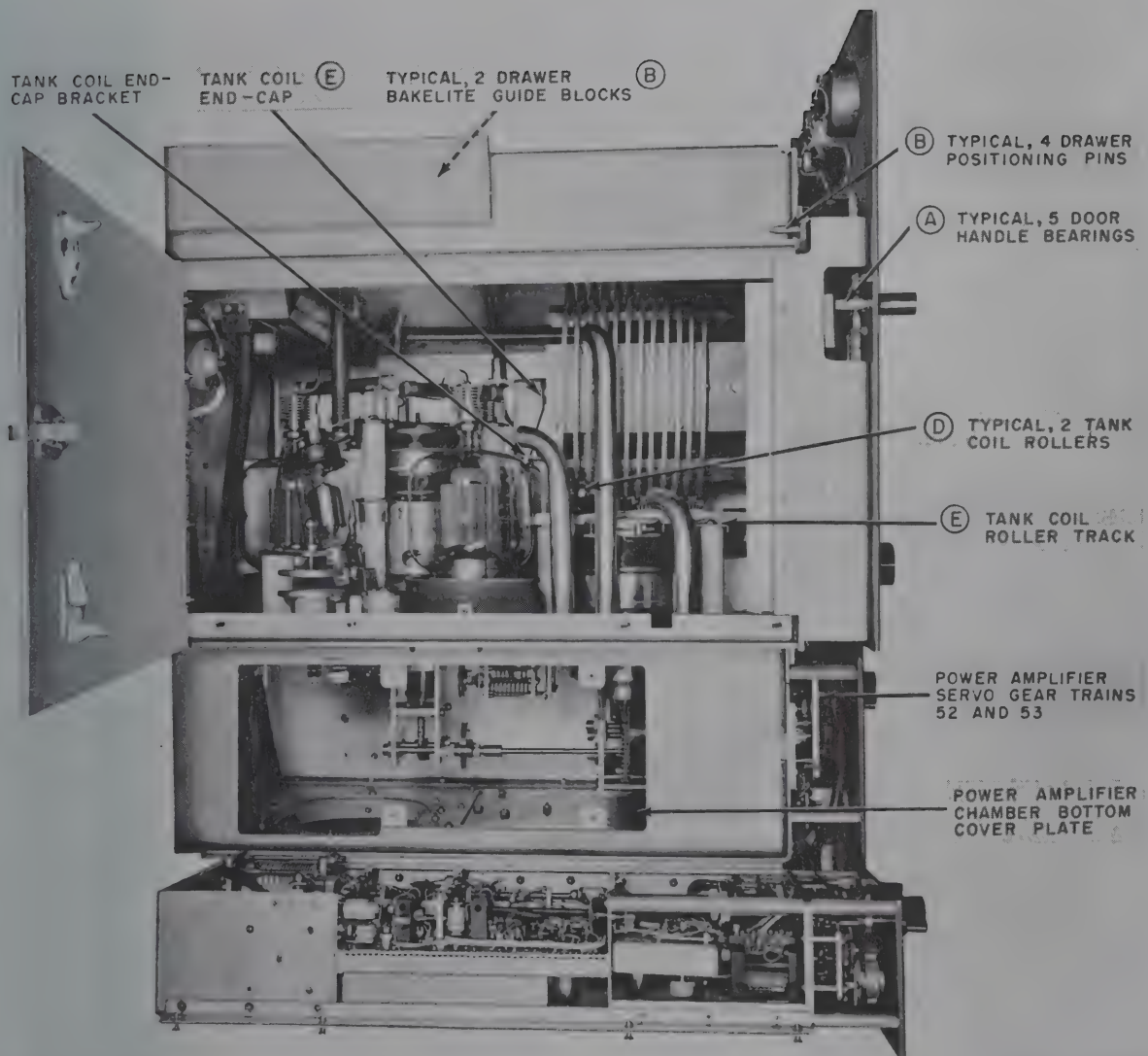
Item	Type of lubricant	Additional instructions	Figure No.
Output coil oilite bearings-----	A	One drop each bearing-----	13
Door and drawer handle bearings-----	A		12
Door and drawer latch blocks (5)-----	B		14
Door hinges-----	A		14
Shorting switch shafts. All cabinets (3)---	B		14
Shorting switch, rf amplifier cabinet-----	A	Lubricate arm pivot points-----	14
Drawer positioning pins (4)-----	B	Two additional drawer positioning pins, not shown, are located on a brace-bar at the rear of the cabinet. Lubricate these as necessary.	12
Drawer bakelite guide blocks-----	B		12
Drawer out-position wheel-----	A		14
Choke coil oilite bearings (2)-----	A		15
Loading coil end bearings-----	A		16
Loading coil end contacts-----	D		16
Loading coil contact slide-----	E		16

Item	Type of lubricant	Additional instructions	Figure No.
Loading coil contact-----	D		16
Tuning and loading servo drive chains (3) and drive chain gears (4).	B	Accessible by removing power AMPLIFIER drawer front panel.	17
Drive chain idler bearings (2)-----	A		17
Tuning servo gear train gears-----	B	Brush on small amount on first two (high speed) gears of train. Others need no lubrication.	19
Tuning servo gear train oilite bearings-----	A	One drop each bearing.-----	19
Loading servo gear train gears-----	B	Brush on small amount of first two (high speed) gears of train. Others need no lubrication.	18
Loading servo gear train oilite bearings-----	A	One drop each year.-----	18
Universal joints (4)-----	A	The items shown on figures 20, 21, and 22 are accessible after removing plate from bottom of pa compartment drawer.	20
Tuning capacitor drive chains and gears---	B		21
Loading capacitor drive chain and gears---	B		22
Tuning capacitor drive shaft bearings-----	A		21
Loading capacitor drive shaft bearings-----	A		22
Tuning capacitor barrel bushing-----	A	Be sure barrel is clean and entire surface is coated with oil. Check with tuning and loading control set to 30-mc tuning point.	21 and 22
Hinge-----	A		23
Tuning shaft bearings-----	A		23
Servo gear train bearings and stop washers (two sets).	A	Saturate bearing lubricating felts with oil yearly. In dry, hot climates, lubricate at 3- to 6-month intervals, or when necessary.	24
Servo gear trains (two trains)-----	B	Brush on small amount on first three (high speed) gears of train. Others need no lubrication.	24
Tuning rack slide and teeth-----	B		25
Band switch gear train bearings-----	A	Saturate bearing lubricating felts with oil yearly. In hot, dry climates, lubricate at 3- to 6-month intervals, or when necessary.	24
Band switch gear train high speed-----	B	Brush on small amount on first two (high speed) gears of train. Others need no lubrication.	24
Line voltage adjusting switch handle bearing.	A		26
Line voltage adjusting switch cleat roller and pivot point.	A		27

Note. The bearings of the three blowers, the bearings in the servo and band switch motors, and all Oilite and other bearings and gears not mentioned in the lubrication instructions have been lubricated where necessary by the manufacturer and require no subsequent lubrication.

LEGEND for marking conditions: Satisfactory, Y. Adjustment, Repair or Replacement required, X. Defect corrected, (X)		DAILY CONDITION FOR MONTH OF DECEMBER																							
NO.	DAILY ITEM	CONDITION EACH WEEK					ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS													CONDITION					
		1ST	2D	3D	4TH	5TH	2D ECH	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	2D ECH- ELON
1.	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT. (Transmitter, receiver, carrying cables, cables, microphones, tubes, spare parts, technical manuals).																								
2.	CLEAN DIRT AND MOISTURE FROM JACKS, PLUGS, COMPONENT PANELS.																								
3.	INSPECT CONTROLS FOR NORMAL OPERATION.																								
4.	CHECK FOR NORMAL OPERATION OF EQUIPMENT. BE ALERT FOR UNUSUAL OPERATION OR CONDITION.																								
WEEKLY																									
5.	CLEAN EXTERIORS OF CASES, MOUNTS.																								
6.	INSPECT CASES, MOUNTS, AND EXPOSED METAL SURFACES FOR RUST, CORROSION.																								
7.	INSPECT CORDS, CABLE, WIRING, BREAKS, FRAYING, UNDUE STRAIN.																								
8.	INSPECT SWITCHES, KNOBS, JACKS, CONNECTORS, RELAYS, MOTORS, PILOT LIGHTS, BLOWERS, ETC.																								
9.	CLEAN AND/OR INSPECT AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS.																								
10.	INSPECT ACCESSIBLE ITEMS FOR LOOSENESS: SWITCHES, KNOBS, JACKS, CONNECTORS, RELAYS, MOTORS, PILOT LIGHTS, BLOWERS, ETC.																								
11.	CLEAN AND/OR INSPECT AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS.																								
12.	INSPECT TERMINAL BOX COVERS FOR CRACKS, DIRT, LEAKS, DAMAGED GASKETS, GREASE.																								
ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS																									
13.	INSPECT TERMINAL BOX COVERS FOR CRACKS, DIRT, LEAKS, DAMAGED GASKETS, GREASE.																								
14.	CHECK TERMINAL BOX COVERS FOR CRACKS, DIRT, LEAKS, DAMAGED GASKETS, GREASE.																								

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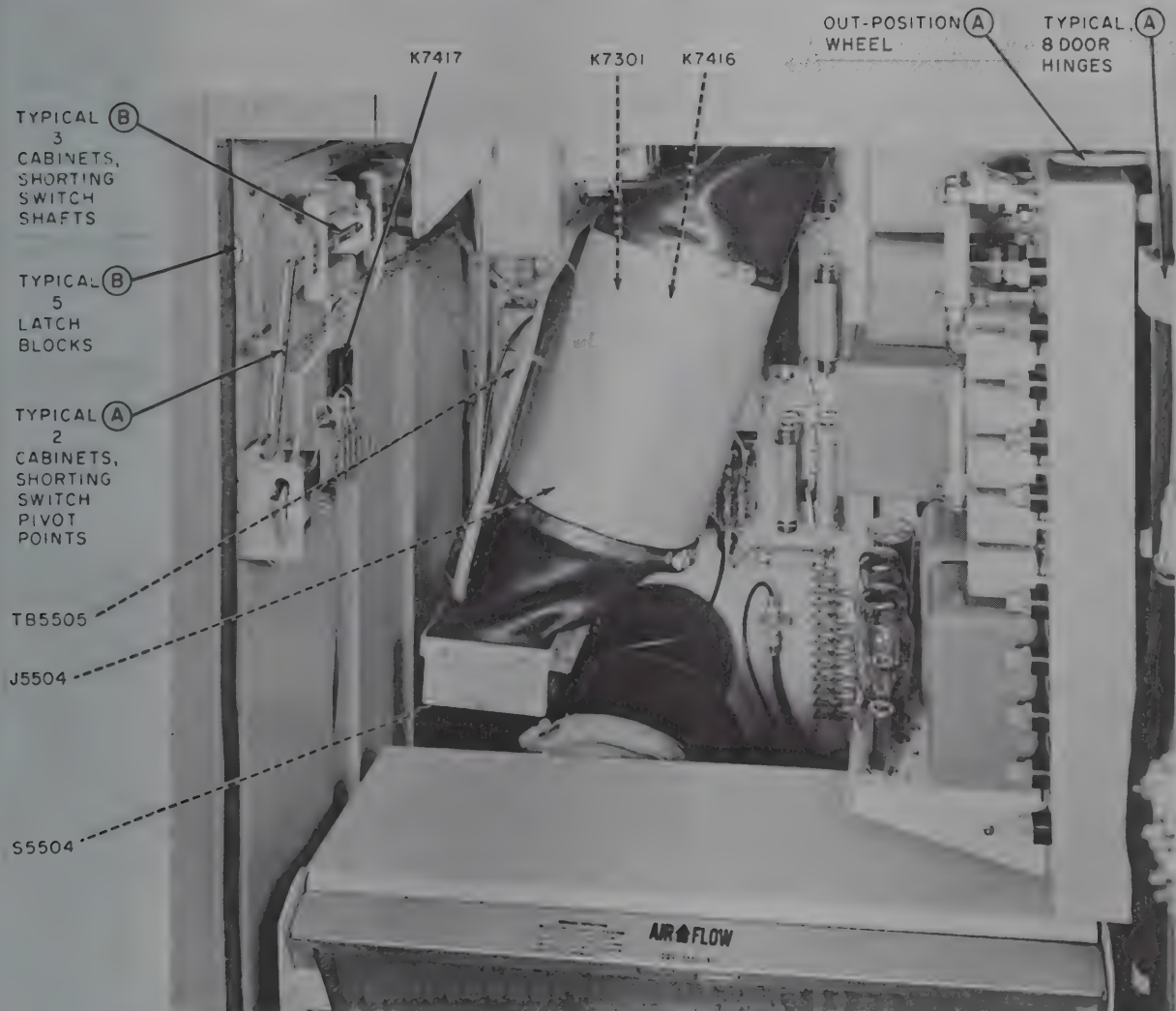
Figure 12. RF amplifier, lubrication points.

OUTPUT COIL
ROLLER SHAFT (D)

OUTPUT COIL
OILITE
BEARINGS (A)

TM5821-212-20-3

Figure 13. Driver chassis output tank coil assembly, lubrication points.



TM5821-212-20-4

Figure 14. RF amplifier, top front view.

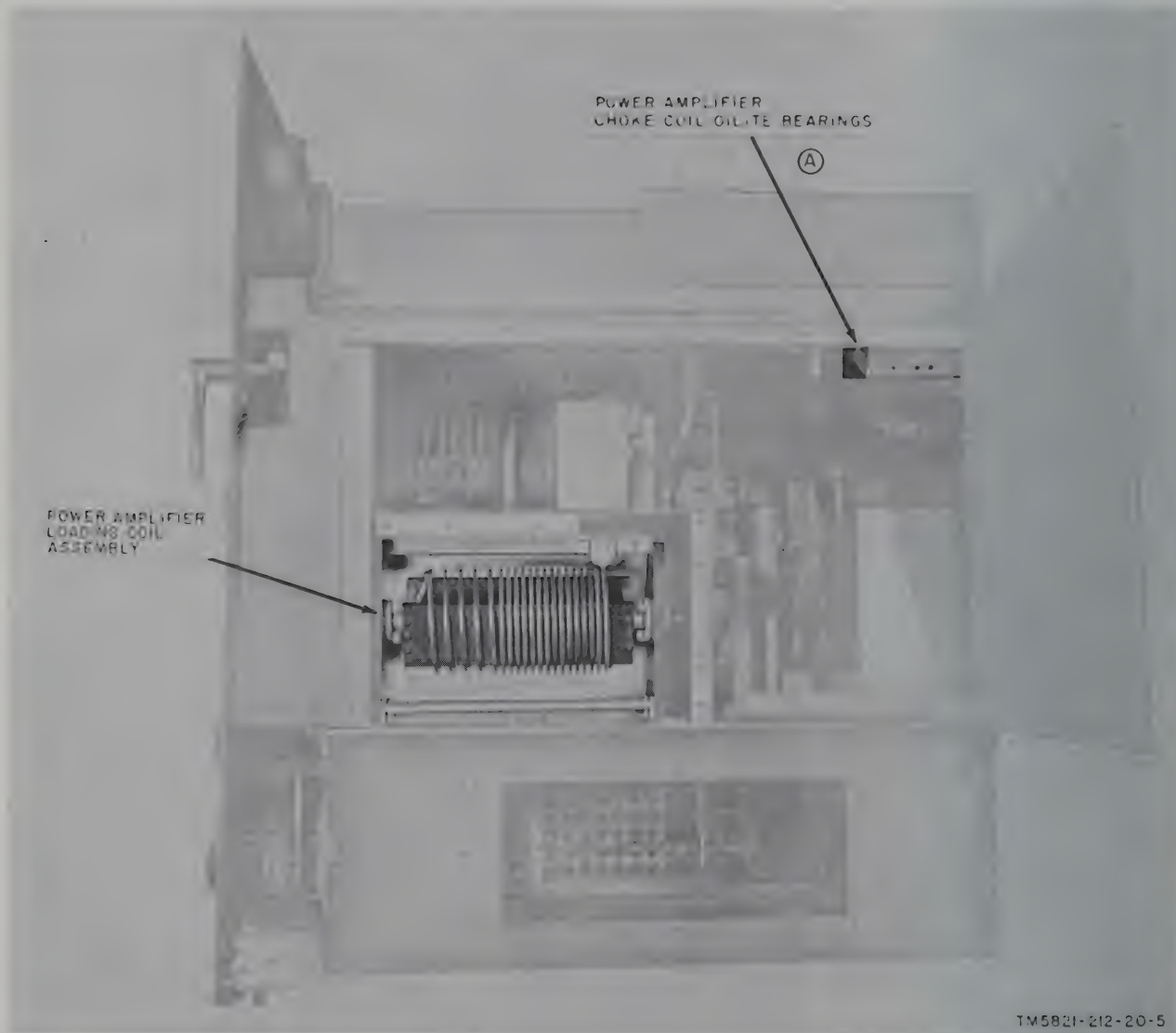
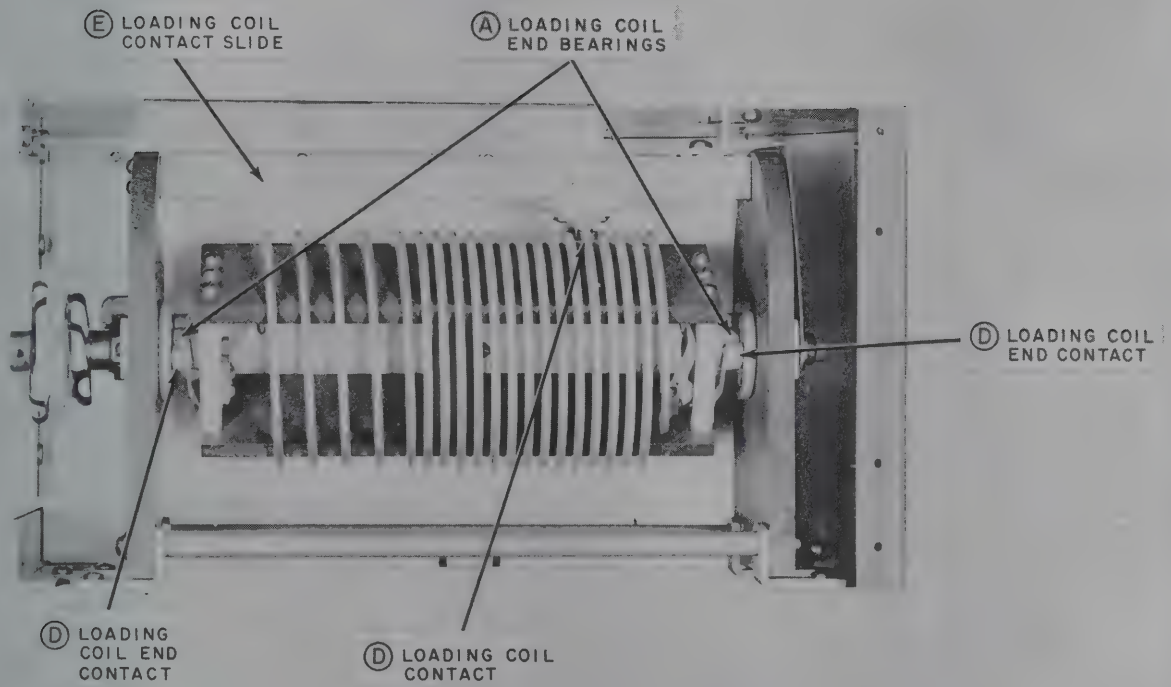
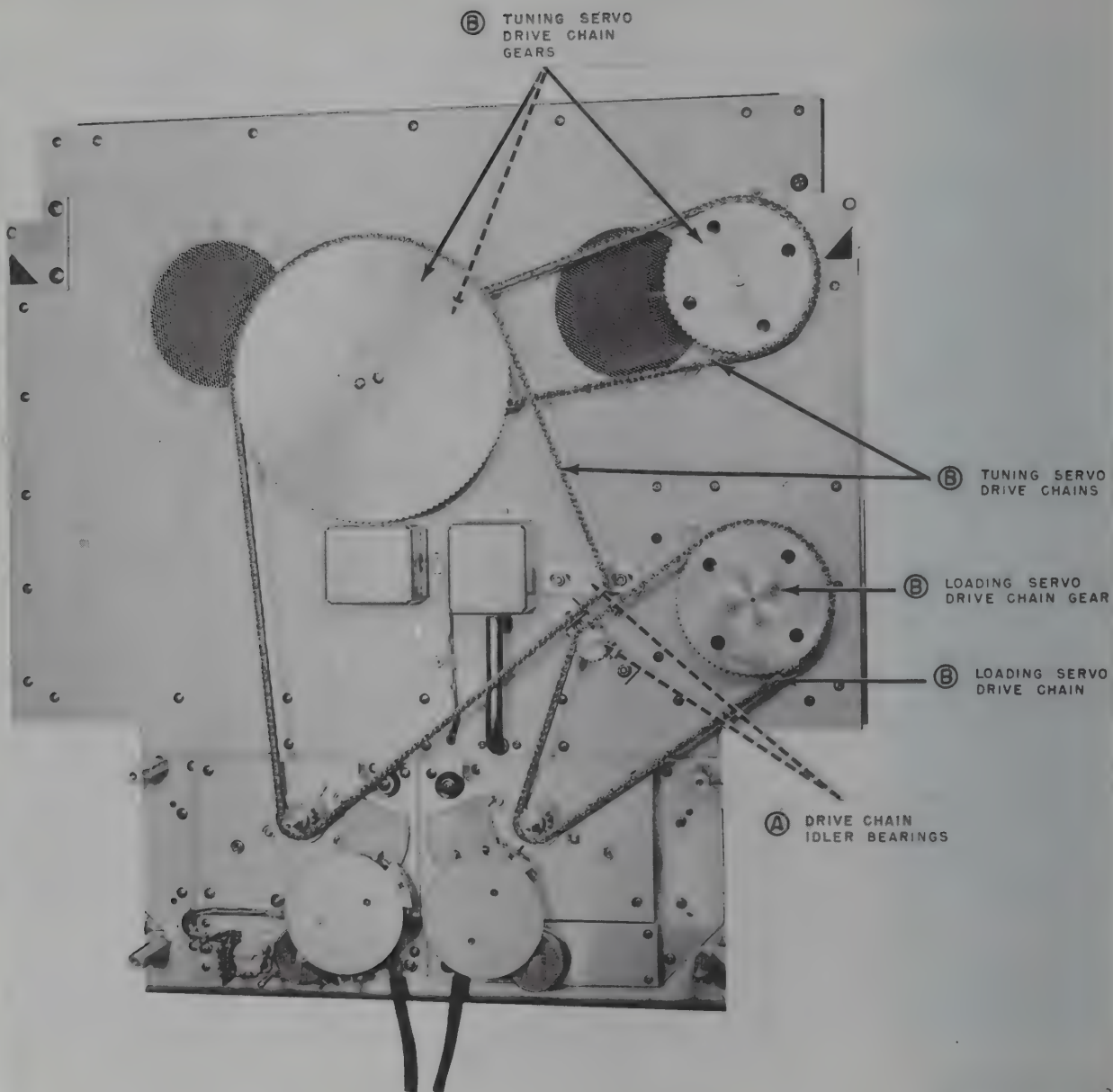


Figure 15. RF amplifier, side view.



TM5821-212-20-6

Figure 16. RF amplifier loading coil assembly, lubrication points.



TM5821-212-20-7

Figure 17. RF amplifier servo assembly, lubrication points.

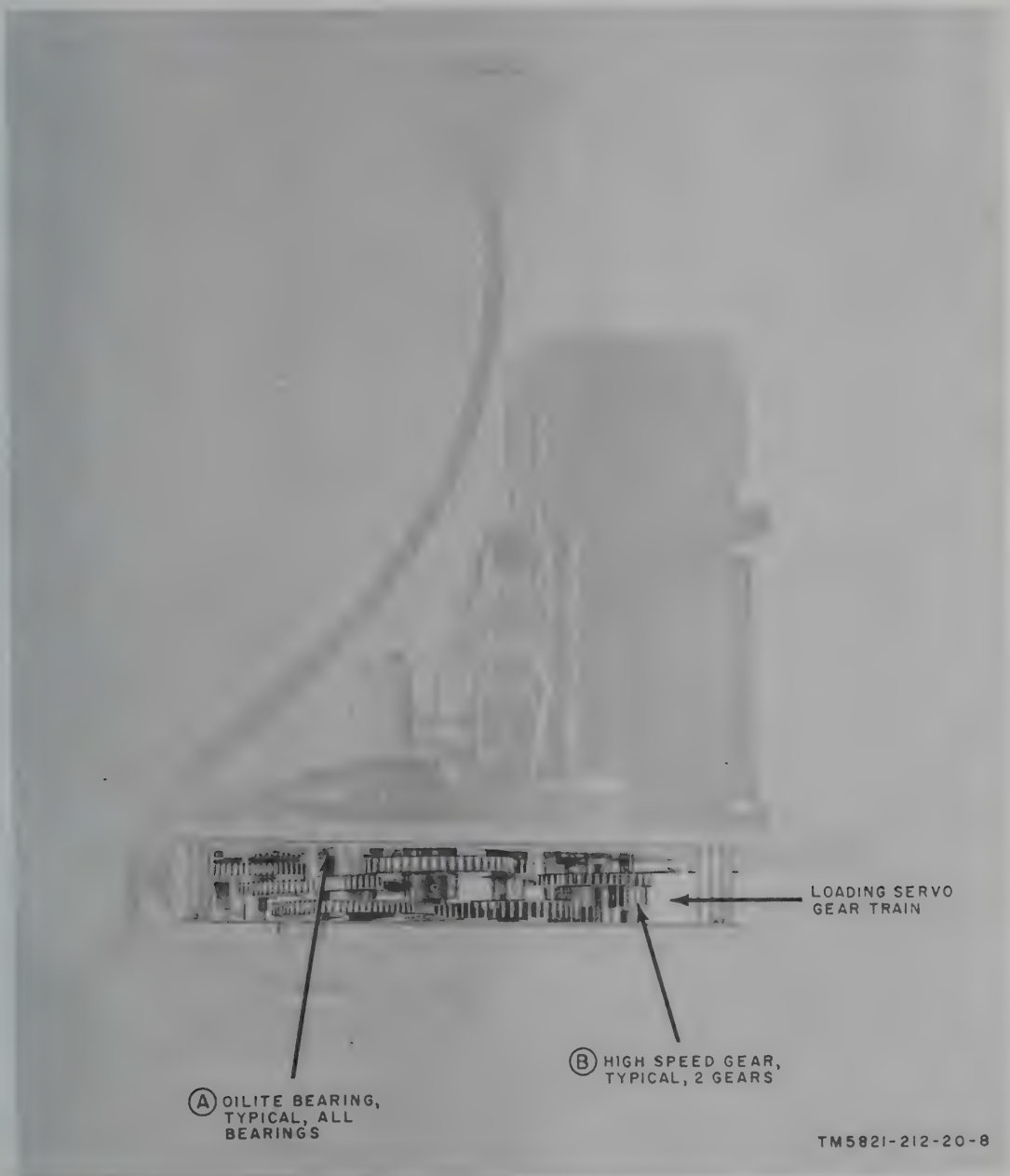
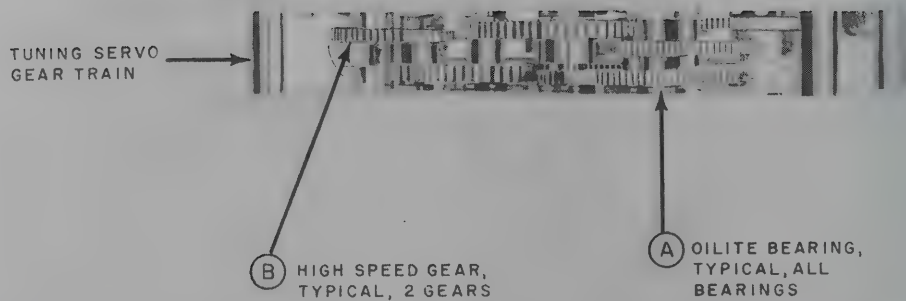
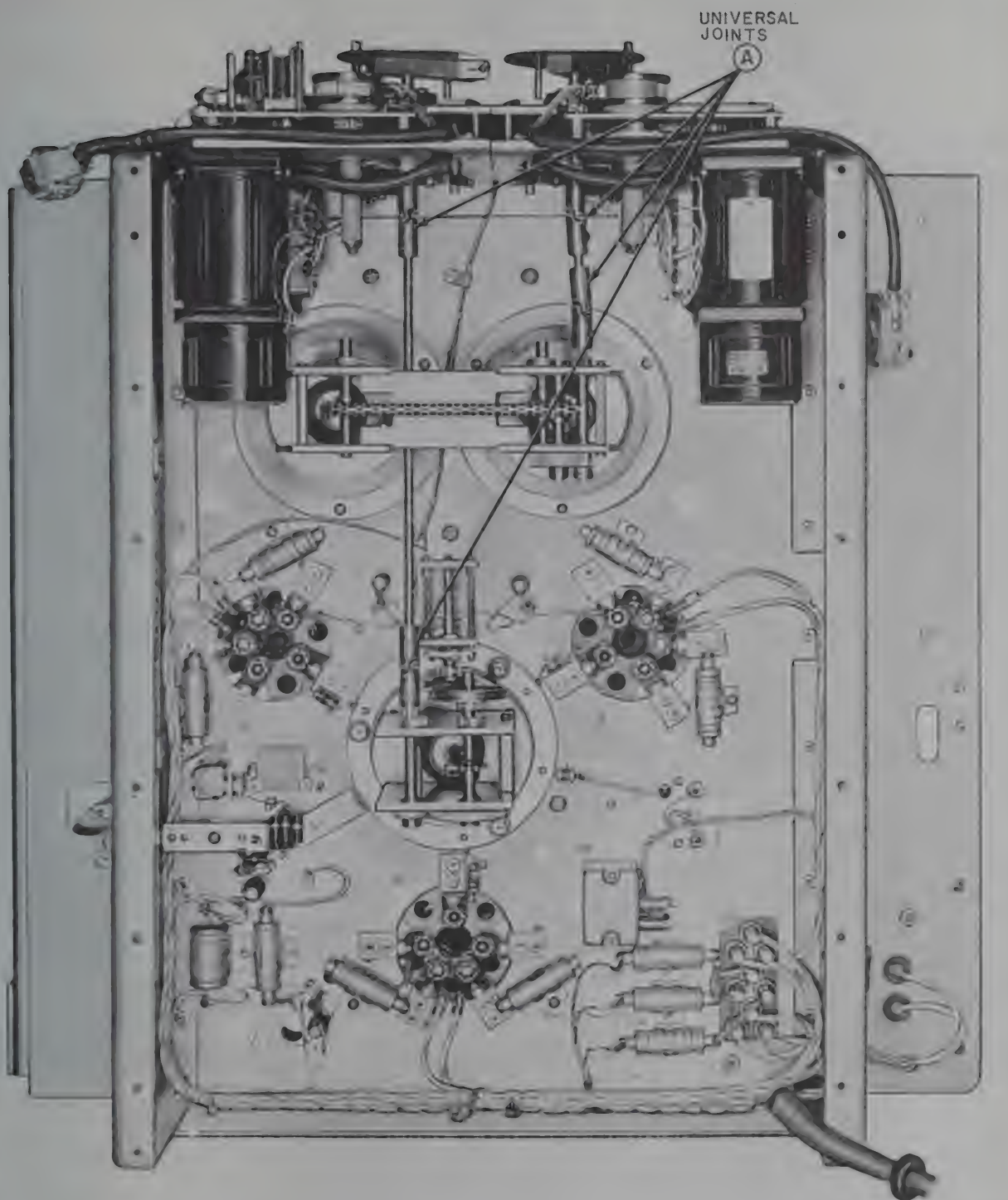


Figure 18. RF amplifier loading servo gear train, front view, lubrication points.



TM5821-212-20-9

Figure 19. RF amplifier tuning servo gear train, lubrication points.



TM5821-212-20-10

Figure 20. RF amplifier universal joints, lubrication points.

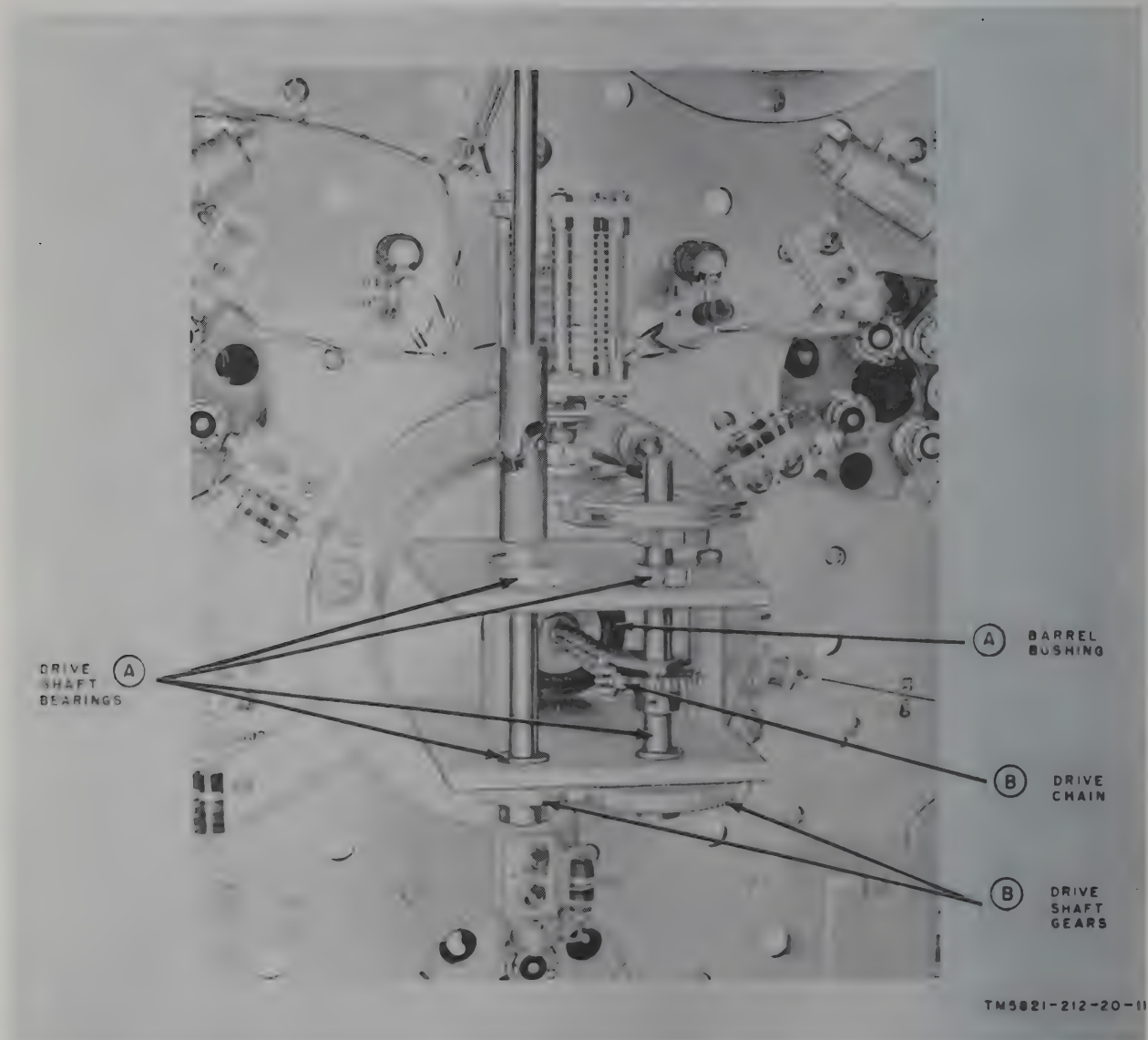


Figure 21. RF amplifier tuning capacitor assembly, lubrication points.

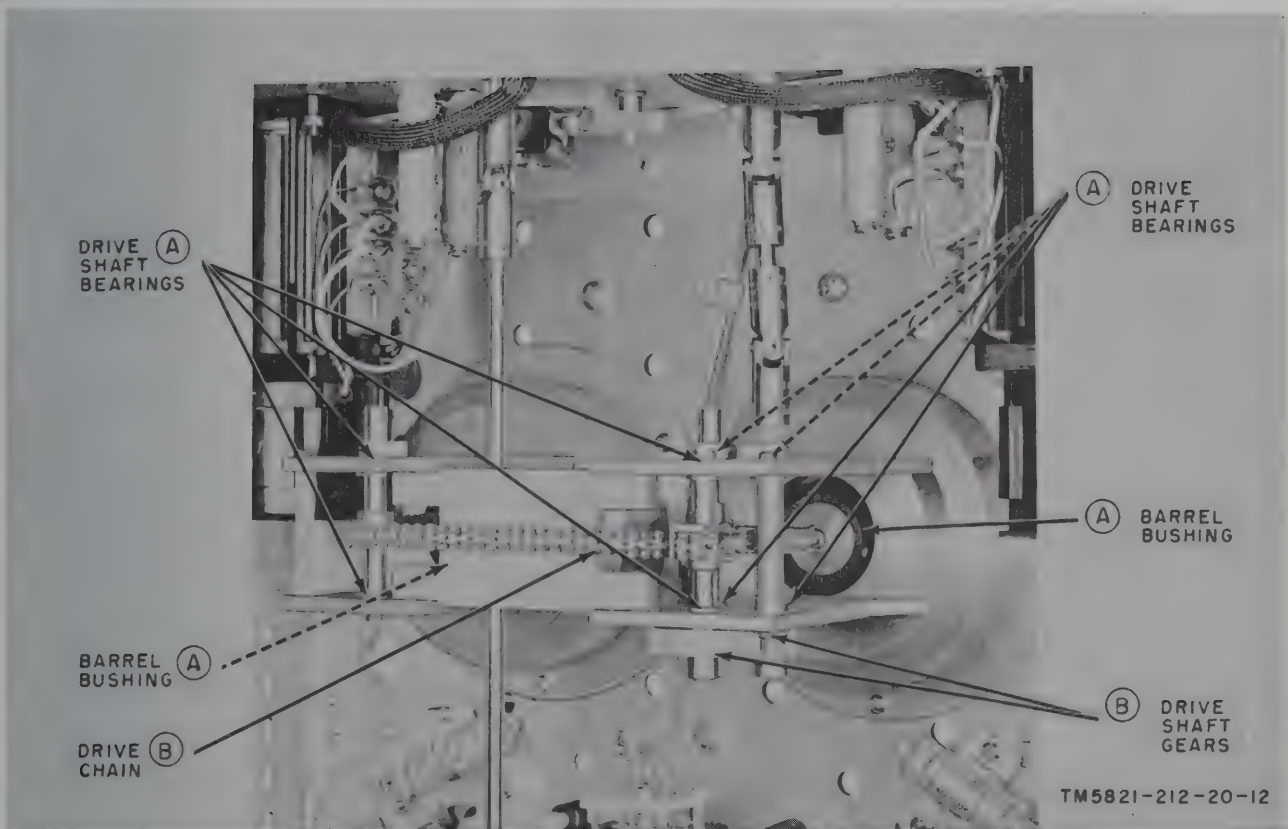


Figure 22. RF amplifier loading capacitor assembly, lubrication points.

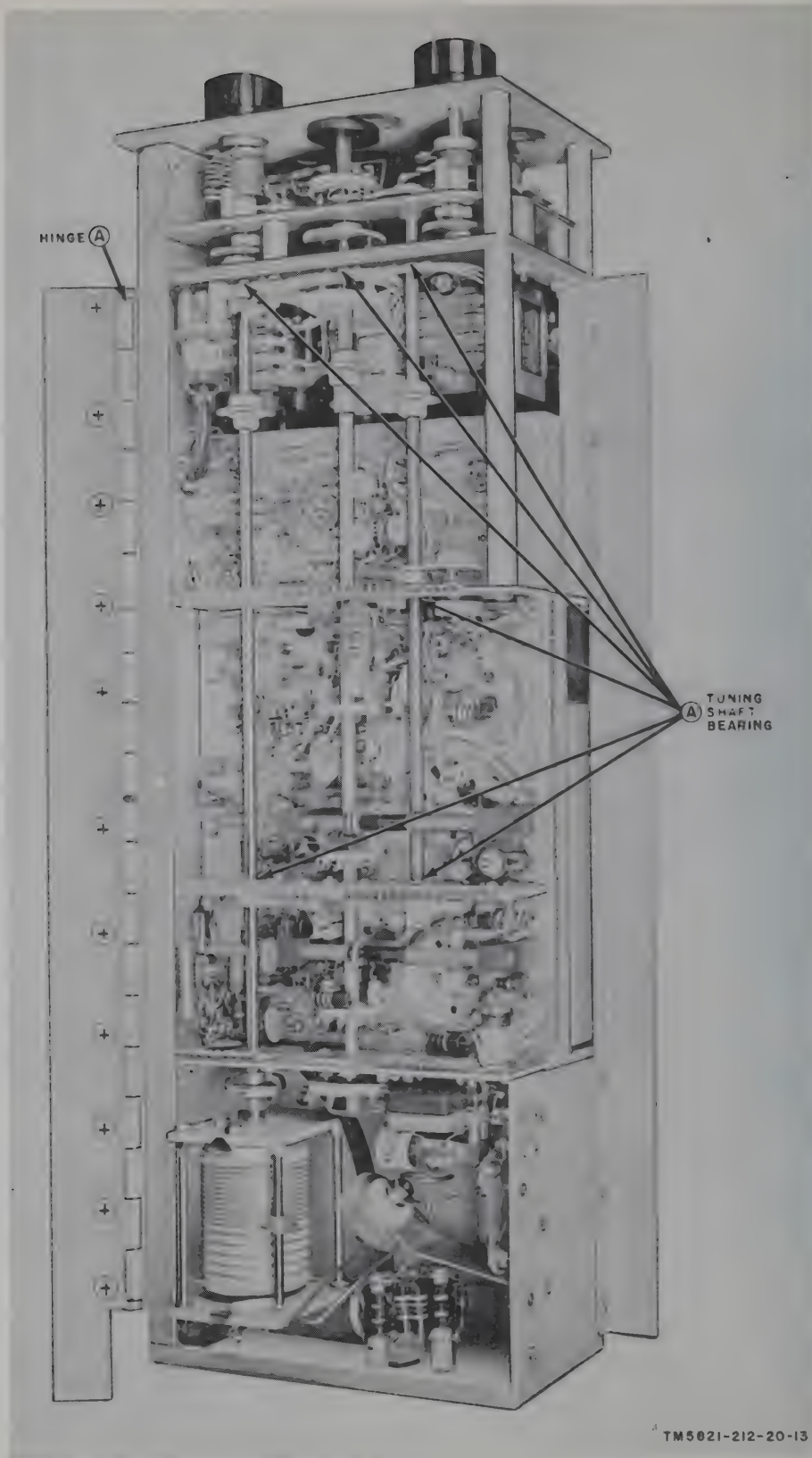
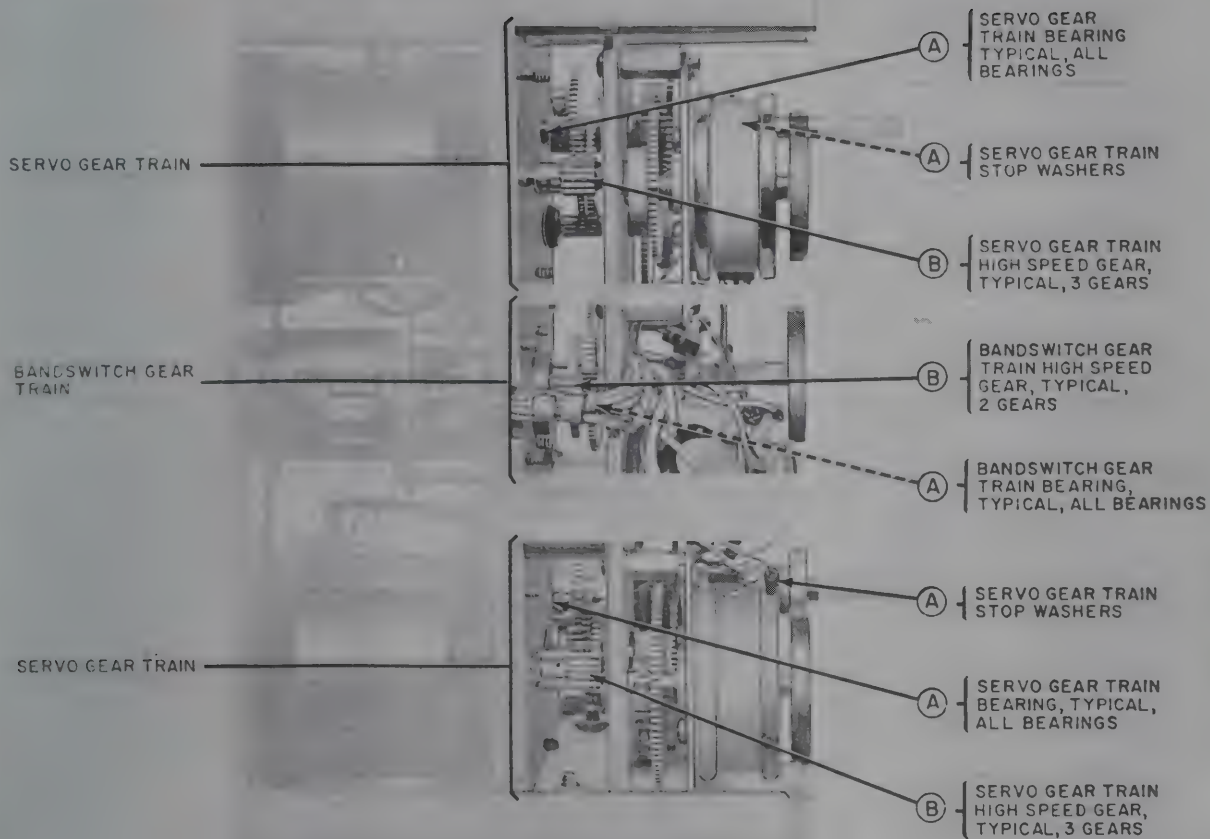
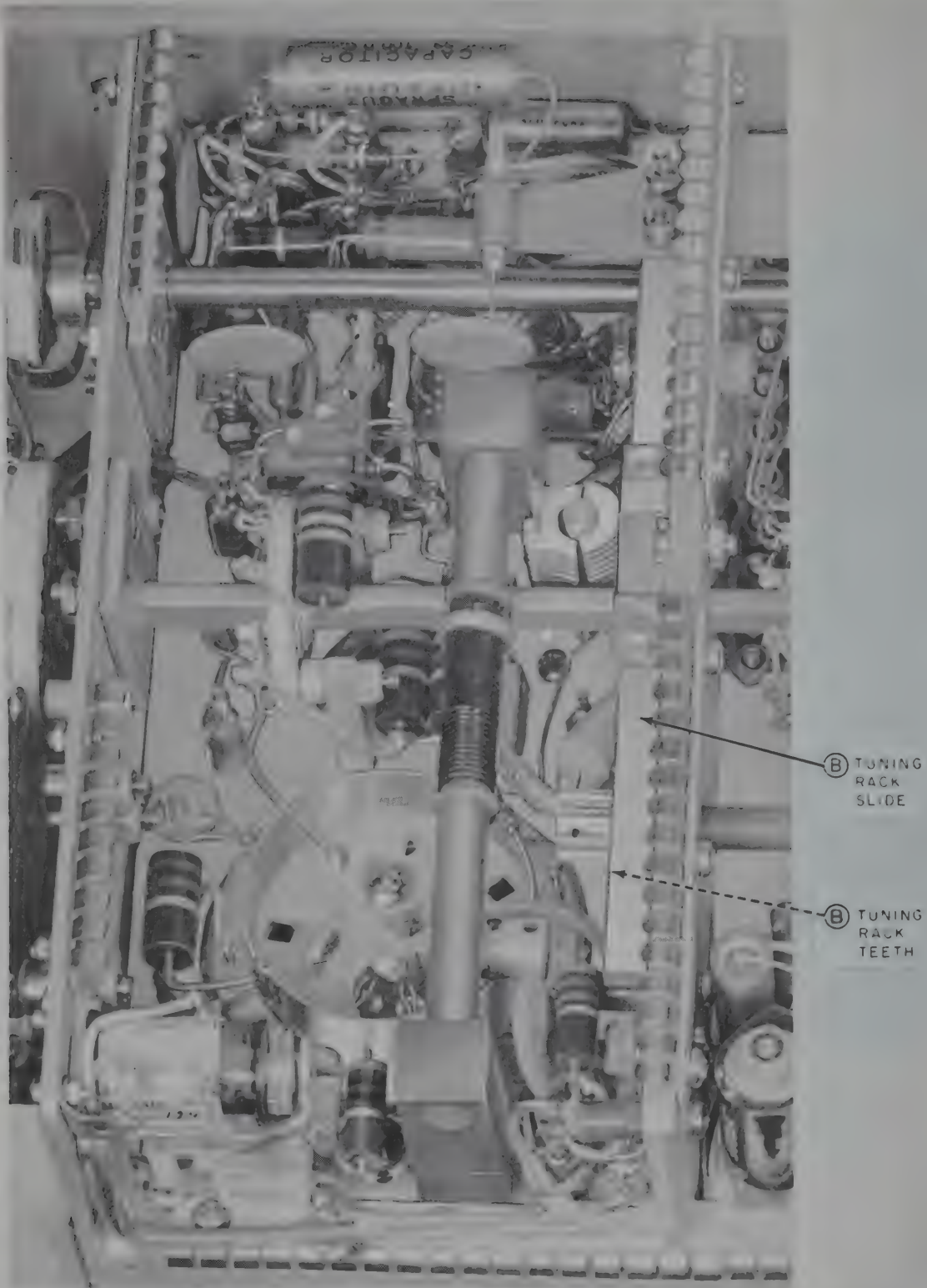


Figure 23. RF amplifier driver chassis shaft bearings and hinges, lubrication points.



TM5821-212-20-14

Figure 24. RF amplifier driver chassis gear trains, lubrication points.



IM5821-212-20-15

Figure 25. RF amplifier driver chassis tuning rack, lubrication points.

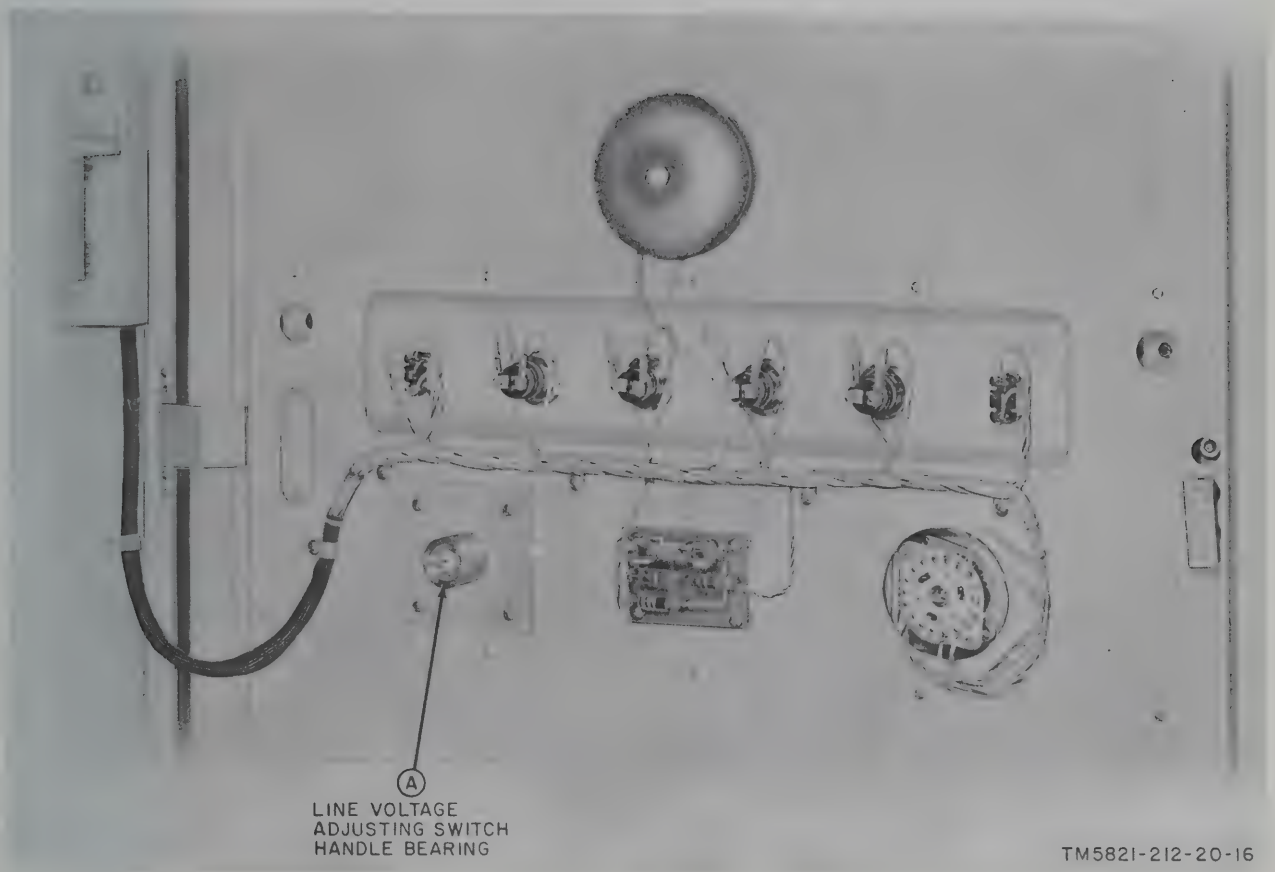
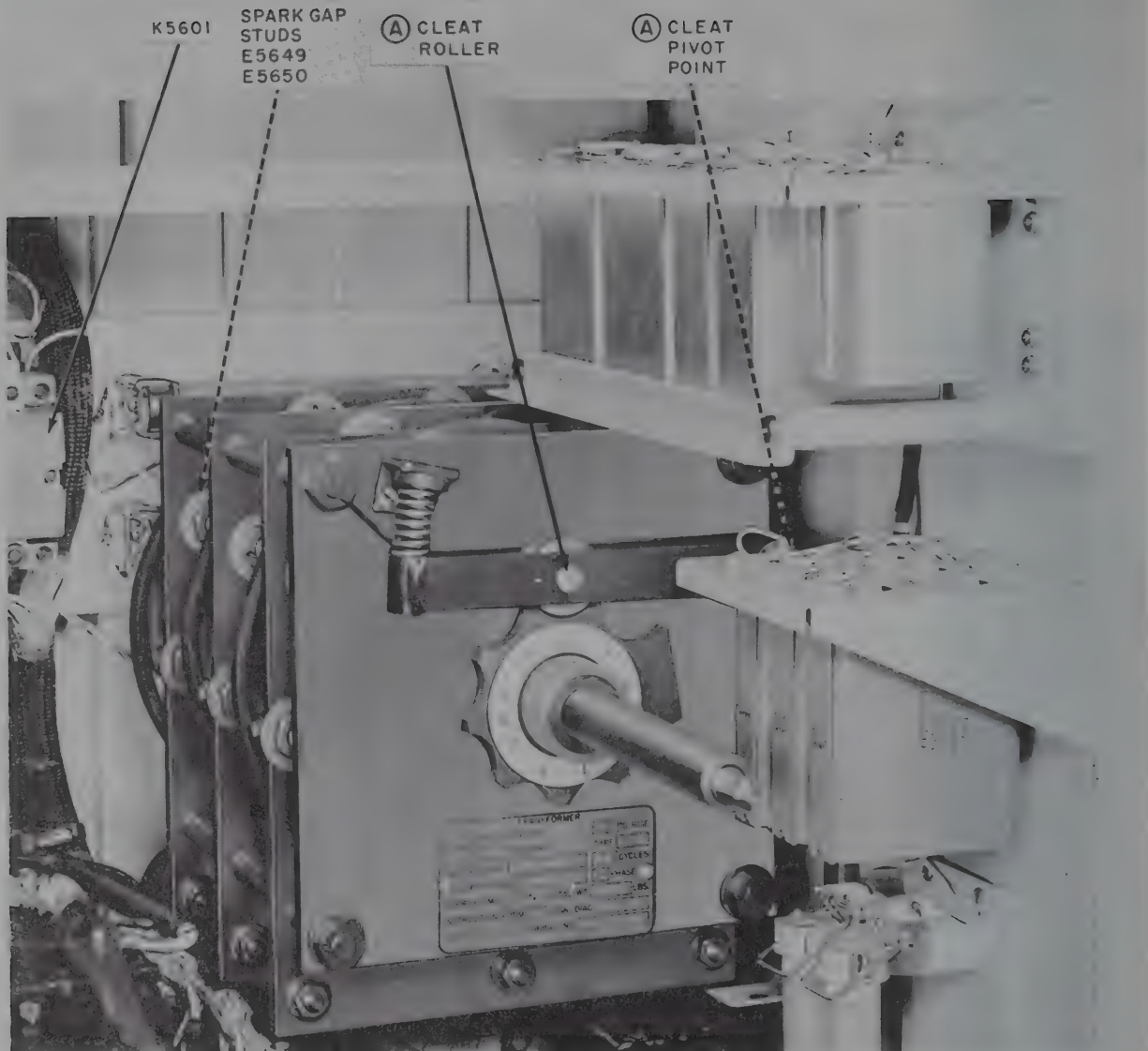


Figure 26. H_v power supply line voltage adjusting switch handle.



TM5821-212-20-17

Figure 27. H_v power supply, front, center view.

Section II. TROUBLESHOOTING

21. Extent of Instructions

a. Troubleshooting the transmitting set at the organizational level is limited to localizing troubles to defective tubes, fuses, relays, cables, and plugs. If the fault can be repaired through organizational procedures, corrective measures are indicated.

b. The techniques that are used include visual inspection, operational tests, and tube substitution. The material is presented in the order which the

repairman would normally use in servicing a defective transmitter. The equipment performance checklist (par. 23) is arranged so that the modulator-oscillator unit (the signal source) is eliminated as a source of trouble before trouble shooting the RF amplifier and hv power supply. When the procedures indicated are not sufficient to determine the source of trouble, troubleshooting at a field maintenance level is required.

22. Visual Inspection

a. When failure is encountered and the cause is not immediately apparent, check as many of the items listed in *b* and *c* below as is practicable before starting a systematic check of the equipment. Do not, however, disassemble the equipment for a complete inspection without some knowledge of the operational symptoms. If possible, obtain information from the operator of the equipment regarding performance at the time the trouble occurred.

b. Complete failure of the equipment often may be caused by one or more of the following faults:

- (1) Loss of primary power.
- (2) Open entrance fuse or circuit breaker at station power distribution panel.
- (3) Open main switch.
- (4) Tripped PWR INPUT circuit breaker CB6001 (fig. 40) in power supply.

c. Partial failure of the equipment often may be caused by one or more of the following faults:

- (1) Burned or damaged relay contacts.
- (2) Defective interchassis connections.
- (3) Defective tube or tubes.

23. Troubleshooting with Equipment Performance Checklist

Warning: Dangerous voltage exist in this transmitting set. Certain testing operations require that the equipment be energized with the cabinet doors or drawers open, thereby exposing the high-voltage points. Whenever a door interlock, shorting switch, or other protective device is blocked or otherwise disabled, there is extreme danger to maintenance personnel. Do not disable the protective devices unless it is absolutely necessary to do so. Remove

all disabling equipment immediately after the maintenance procedure is complete. Do not leave the equipment location while protective devices are disabled. Always ground circuits before touching them. Potential of 5,000 volts or more exist in this equipment. Do not service alone. Do not depend on door interlocks and grounding switches for protection. Set the rf amplifier STANDBY switch to OFF whenever it is not absolutely necessary to operate the equipment while making tests.

a. *Purpose and Use.* The equipment performance checklist supplements the preliminary starting procedure and operational check list (TM 11-5820-212-10). Operate the equipment as directed and check for normal indications. If an abnormal indication is obtained, perform the corrective measures outlined in the checklist.

b. *Troubleshooting Procedures.* The front panels of the transmitting set indicate the conditions within the equipment. Improper operation of the transmitting set will usually result in unusual indications on the front panel meters on one of the three units. If the front panel meter readings do not lead directly to unit localization, the checklist (*c* below) will aid in localizing the trouble to a particular unit. All corrective measures which the organizational repairman can perform are listed in the *Corrective measures* column. If the indicated corrective measures fail to correct the defect, troubleshooting at a field maintenance level is required.

c. *Checklist.* Perform the preliminary starting procedures and the procedures in the operational checklist (TM 11-5820-212-10) and then proceed with the following checklist.

PRELIMINARY STARTING PROCEDURE					
Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
1	RF amplifier	STANDBY switch	Set to OFF.	ADJUSTED LINE meter indicates 220 volts.	Check power input connections at TB6005 (fig. 4, 6, and 40). Check PWR INPUT circuit breaker. CB6001.
2	Hv power supply	All circuit breakers	Set to ON.		
3	Hv power supply	ADJUSTED LINE VOLTAGE switch, LINE ADJUST switch, ADJUSTED LINE meter.	Set the ADJUSTED LINE VOLTAGE switch to L1L2; adjust the line voltage to 220 volts with the LINE ADJUST switch. Repeat above procedure with the ADJUSTED LINE VOLTAGE switch in the L1L3 and L2L3 positions. SET to ON.		
4	Blower filter assembly (lowest panel on modulator-oscillator).	LINE SWITCH		Switch remains ON. No blown fuse indicators energized. Amber LINE indicator on power supply control panel energized.	Check connections between J3820 and TB5504 and TB5505 (fig. 5). Check cable connections in junction box (fig. 39) located in blower filter assembly.
5	Automatic line voltage control.	AUTOMATIC-MANUAL switch.	Set to AUTOMATIC.	Manual LINE ADJUST knob may or may not turn, but will reach a position of rest if the line voltage remains constant. 115 volts	Check J3819 and connections between automatic line voltage control and junction box (fig. 39).
6	Automatic line voltage control.	LINE VOLTAGE meter	Check reading		Adjust VOLTAGE and SENSITIVITY controls (par. 16a).
7	Power supply	Meter switch	Set to +300V FREQ. STD.	Meter indicates green area.	Check V2301 (fig. 36).
8	Power supply	Meter switch	Set to position +150V FREQ. STD.	Meter indicates within green area.	Check V2301 and V2305 (fig. 36).
9	Frequency standard	METER switch	Set to position 1	Meter indicates between 2 and 4.	Check V605 and V606 (fig. 38).
10	Frequency standard	METER switch	Set to position 2	Meter indicates between 2 and 6.	Check V601 through V604 (fig. 38).
11	Frequency standard	METER switch	Set to position 3	Meter indicates 4.5 to 6.5	Check V901 and V902 (fig. 38).
12	Frequency standard	METER switch	Set to position 4	Meter indicates 5 to 7	Check V901 and V902 (fig. 38).
13	Frequency standard	METER switch	Set to position 5	Meter indicates 4 to 7	Check V901 and V902 (fig. 38).
14	Frequency standard	METER switch	Set to position 6	Meter indicates 5 \pm 0.1	Adjust R701 and check V503 (fig. 38).
15	Frequency standard	METER switch	Set to position 7	Meter indicates 5 \pm 0.1	Adjust R702 and check V504 (fig. 38).
16	Frequency standard	METER switch	Set to position 8	Meter indicates 4 to 6	Check V501 (fig. 38).
17	Frequency standard	METER switch	Set to position 9	Meter indicates 4 to 7	Check V1301 (fig. 38).
18	Frequency standard	METER switch	Set to position 10	Meter indicates 5 to 8	Check V1302 (fig. 38).
MODULATOR OSCILLATOR EQUIPMENT PERFORMANCE					

19	Frequency standard	METER switch	Set to position 11	Meter indicates 2 to 4	Check V4701, V4702, and V4703 (fig. 38).
20	Frequency standard	METER switch	Set to position 12	Meter indicates 3 to 5	Check V4703 (fig. 38).
21	Exciter monitor	Autotune locking keys	Turn clockwise until tight	Dial knobs locked in position	Higher exhelon repair required.
22	Power control panel	FILAMENT ON switch	Press button	Green filament indicator glows	Check blown fuse indicators on power supply.
				Blower runs	Check interconnecting cables.
23	Power supply	Meter switch	Set to position 8	Autotunes may or may not run, depending on switch settings.	Check V2304.
24	Power control panel	PLATE ON switch	Press button	Meter reads within green area	Check interconnecting cabling.
				Red indicator light energized	If the STABILIZED light fails to energize the fault is probably in the SMO unit; proceed with this check list to isolate the trouble.
				After a few seconds blue STABILIZED light engerized.	
25	Power supply	Meter switch	Set to +300V EXCITER	Meter reads within green area	Check V2302, V2303, V2306, and V2309 (fig. 36).
26	Power supply	Meter switch	Set to +125V EXCITER	Meter reads within green area	Adjust R2332 (fig. 36).
27	Power supply	Meter switch	Set to +210V EXCITER position.	Meter reads within green area	Adjust R2335. Check V2306 (fig. 36).
28	Exciter monitor	Tuning control	Set to desired operating frequency (TM 11-5821-212-10) or use one of the test frequencies listed in paragraph 16.		
29	Exciter monitor	METER SWITCH	Set to position 2.	Meter reads 5 \pm 2	Adjust R1742 with TP1706 grounded (fig. 25).
30	Exciter monitor	MANUAL TUNE button	Depress button	Meter reads not less than 2 for each band setting (1 through 5).	Check V1501, V1502, V1504, V1505, V1701, and V1702 (fig. 35).
31	Exciter monitor	METER SWITCH	Set to position 3		If only one or two bands are low check V1502 first.
32	Exciter monitor	METER SWITCH	Set to position 4	Meter reads not less than 3 on bands 1 and 2, not less than 2 on bands 3 and 4, and not less than 1 on band 5.	Same as item 31.
33	Exciter monitor	METER SWITCH	Set to position 5	Meter reads not less than 5	Check master oscillator V1503.
34	Exciter monitor	METER SWITCH	Set to position 6	Meter reads not less than 4 on bands 3, 4, and 5.	Check V1506 and V1507 (fig. 34).
35	TSB modulator	Meter selector switch for line 1.	Set to +6 db.		
36	TSB modulator	Meter selector switch for line 2.	Set to \pm 6 db.		

MODULATOR OSCILLATOR EQUIPMENT PERFORMANCE

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
37	TSB modulator	Line 1 and line 2 inputs	Adjust the audio frequency input levels of both LINE 1 and LINE 2 for peak readings of 0 on their respective VU meters. Set both knobs to counter-clockwise stops. Set to position 1. Set to TEST.	0 VU on both meters	Higher echelon repair.
38	TSB modulator	DB CARRIER ATTENUATION.			
39	Exciter monitor	METER SWITCH			
40	Exciter monitor	MONITOR INPUT selector switch.			
41	Exciter monitor	MONITOR LEVEL control	Rotate clockwise to obtain a midscale reading on the meter. Set to EXCITER INPUT.	Control setting 7 or less	Check V1401 through V1406 (fig. 35). Perform the following: Pull out the TSB modulator drawer. Set ALC switch S401 to OFF (fig. 37). Set age switch S4501 to OFF (fig. 37). Set the DB CARRIER ATTENUATION control to 0. Adjust level control R4505 (fig. 37) to produce midscale reading on the meter when the MONITOR LEVEL control is set on 3. Set S4501 to NORM and ALC switch S401 to ON (fig. 37).
42	Exciter monitor	MONITOR INPUT selector switch.			
43	Exciter monitor	MONITOR LEVEL control	Rotate clockwise to obtain a midscale reading on the meter.	Control position should be between 2.5 and 3.5.	
44	TSB modulator	DB CARRIER ATTENUATION controls.	Set to 0.		
45	TSB modulator	SIDEBAND selector switches	Set to OFF		
46	Exciter monitor	MONITOR INPUT selector switch.	Set to EXCITER OUTPUT.		
47	Exciter monitor	Frequency controls	Set to 1.7000 mc	Meter on exciter monitor indicates between 2.5 and 3.5. Dial windows indicate 1.7000 mc.	Higher echelon repair required. Refer to paragraph 16.

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48	Exciter monitor-----	MONITOR LEVEL control-----	Set to obtain midscale meter reading.	Control setting not higher than 4.	Check mixer amplifier A (1.7-2.3 mc) V1801 through V1804 (fig. 34).
49	Exciter monitor-----	BAND switch-----	Set to band 2.	Control setting not higher than 4.	Check mixer amplifier B (2.3-4.3 mc) V1901 through V1904 (fig. 34).
50	Exciter monitor-----	MONITOR LEVEL control-----	Set to obtain midscale meter reading.		
51	Exciter monitor-----	BAND switch-----	Set to band 3.	Control setting not higher than 8.	Check mixer amplifier C (4.3-8.3 mc) V2001 through V2003 (fig. 34).
52	Exciter monitor-----	MONITOR LEVEL control-----	Set to obtain midscale meter reading.		
53	Exciter monitor-----	BAND switch-----	Set to band 4.	Control setting not higher than 8.	Check mixer aplifier D (8.3-16.3 mc) V2101 through V2103 (fig. 34).
54	Exciter monitor-----	MONITOR LEVEL control-----	Set to obtain midscale meter reading.		
55	Exciter monitor-----	BAND switch-----	Set to band 5.	Control setting not higher than 8.	Check mixer amplifier E (16.3-30 mc) V2201 through V2203 (fig. 34).
56	Exciter monitor-----	MONITOR LEVEL control-----	Set to obtain midscale meter reading.		
57	RF amplifier-----	POWER switch-----	Set to TUNE.	FILAMENT indicators light on RF amplifier and power supply. Blowers run-----	Check PA BLOWER circuit breaker CB6008 (fig. 40) and air switch S5504 (fig. 14). Check blower. Check PS BLOWER circuit breaker CB6007 and air interlock switch S6101 (fig. 40). Check blower. Check CONTROL fuse F7402 (fig. 30). Check indicator lamps. Check indicator lamp. Check CW/FSK relay K7406, HLAM relay K7403, SSB relay K7407, and latch relay K7401 (fig. 30). Higher echelon repair required.
58	RF amplifier-----	CONTROL switch-----	Set to LOCAL.		
59	RF amplifier-----	SERVICE switch-----	Set to CW/FSK.		
60	RF amplifier-----	TUNING switch-----	Set to MANUAL.		
61	RF amplifier-----	AUTOMATIC TUNING switch-----	Set to CYCLE OFF.		
62	RF amplifier-----	TRANSMITTER TEST switch-----	Set to OPERATE.	CW/FSK indicator lights-----	
63	RF amplifier-----	STANDBY switch-----	Press ON button-----		
				Band switch set to the proper band. The BANDSWITCH dial indicates the setting.	

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
				After 30 seconds, the BIAS indicators light on the RF amplifier and power supply.	Check the PA BIAS circuit breaker CB6009 (fig. 40). Check the BIAS PLATE fuse F5801 and the BIAS FIL fuse F5802 (fig. 30). Check interlock switches S6106 through S6109 (fig. 40). Check the indicator lamps. Check interlock relay K7404 pa bias relay K7409, overload relay K7410, and underload relay K7411 (fig. 30). Check filament interlock relay K5602 in the power supply (fig. 40). Check to see that the BLOWER air interlock in the dummy antenna (fig. 15, TM 11-5821-212-10) is ON. Check air interlocks S5504 (fig. 14) and S6101 (fig. 40). Check pa bias supply tubes V5801, V5802, V5803, V5804 and V5805 in the pa bias supply (fig. 30). Adjust pa bias potentiometer R5806 (fig. 30). Check V5801, V5802, V5803, V5804, and V5805 in the pa bias supply (fig. 30). Adjust driver bias potentiometer R5814 (fig. 30). Check V5801, V5802, V5803, V5804, and V5805 in the pa bias supply (fig. 30).
64	RF amplifier-----	MULTIMETER switch and MULTIMETER.	Set switch to POWER AMPLIFIER BIAS 0-500V.	MULTIMETER indicates approximately -150 volts.	
65	RF amplifier-----	MULTIMETER switch and MULTIMETER.	Set to DRIVER-BUFFER BIAS 0-100V.	MULTIMETER indicates approximate -70 volts.	
66	RF amplifier-----	PA PLATE TUNING and PA LOADING controls.	Set the PA PLATE TUNING and PA LOADING controls so that their associated dials read approximately the correct frequency. Turn the BUFFER TUNING and DRIVER PLATE TUNING controls in a		
67	RF amplifier-----	BUFFER TUNING and DRIVER PLATE TUNING controls.			

M A N U A L T U N I N G

68	RF amplifier-----	PLATE ON switch-----	counterclockwise direction to the stop position. Set to ON-----	<p>PLATE indicators light on the RF amplifier and power supply.</p> <p>PA PLATE meter indicates approximately 3,000 volts.</p> <p>BUFFER PLATE Meter indicates approximately 1,200 volts.</p> <p>PA SCREEN meter reads approximately 600 volts.</p>	<p>Check the indicator lamps.</p> <p>Check interlock relay K7404, pa bias interlock relay K7409 alarm relay K7402, and latch relay K7401 (fig. 30).</p> <p>Check HV PLATE circuit breaker CB6003 (fig. 40).</p> <p>Check HLAM relay K7403 (fig. 30). Check V5601 through V5606 (fig. 28).</p> <p>Check RECT FIL circuit breaker CB6005 (fig. 40).</p> <p>Check BUFFER PLATE circuit breaker CB6006 (fig. 40).</p> <p>Check V5607 and V5608 in the buffer plate supply (fig. 29).</p> <p>Check PA SCREEN circuit breaker CB6010 (fig. 40).</p> <p>Check HV alarm relay K5604 (fig. 29).</p> <p>Check V5701 and V5702 in the pa screen supply (fig. 29).</p> <p>Check the RF input and output cable connections.</p>
69	RF amplifier-----	BUFFER TUNING control-----	Adjust clockwise for the first peak in the DRIVER CATHODE meter reading.	<p>Peak in DRIVER CATHODE meter reading occurs between 100 and 160 ma.</p>	<p>Remove the RF input from J5504 (fig. 14); set the MULTIMETER switch to INPUT AMPLR CATHODE; set the POWER switch to LOW. See that the MULTIMETER indicates between 8 and 11 ma. If the meter reading is incorrect, replace V2901 (fig. 33) to determine whether the tube or circuit is defective.</p> <p>With the RF input removed and the POWER switch set to LOW, set the MULTIMETER switch to BUFFER</p>

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
					AMPLER CATHODE 0-500MA. The MULTIMETER should read between 40 and 120 ma. If the meter reading is incorrect, replace V2902 (fig. 33) to determine whether the tube or circuit is defective. With the RF input removed and the POWER switch set to LOW, see that the DRIVER CATHODE meter reads between 130 and 250 ma. If the meter reading is incorrect, replace V2903 (fig. 33) to determine whether the tube or circuit is defective. Set the POWER switch to TUNE and reconnect the RF input. Replace V2903 (fig. 33).
70	RF amplifier-----	DRIVER PLATE TUNING control.	Adjust clockwise for the first dip in the DRIVER CATHODE meter reading. Adjust for a dip in PA PLATE meter reading.	Dip in DRIVER CATHODE meter reading occurs between 130 and 250 ma. PA GRID meter reads between 70 and 180 ma.	
71	RF amplifier-----	PA PLATE TUNING control.			
72	RF amplifier-----	POWER switch-----	Set to LOW-----	DRIVER CATHODE meter reading increases slightly. PA PLATE meter reading does not increase beyond 1.5 amperes.	If no dip occurs, reduce loading by setting the PA LOADING control to a lower frequency; then adjust the PA PLATE TUNING control again for a dip at the proper frequency. If PA PLATE meter reading exceeds 1.5 amperes, return the POWER switch to the TUNE position and reduce loading by setting the PA LOADING control to a lower frequency. Readjust the PA PLATE TUNING control for a dip in the PA PLATE meter reading. Check the antenna connections.
73	RF amplifier-----	PA PLATE TUNING and PA LOADING controls.	Adjust both controls until resonance occurs when the	PA PLATE meter reads 1 ampere. PA GRID meter	

MANUAL TUNING

74	RF amplifier.....	POWER switch.....	PA PLATE meter reads 1 ampere. Set to NORMAL.....	reads between 80 and 180 ma. Antenna line current meter reading increases. PA PLATE meter reading increases.	Check normal power relay K7405 (fig. 30). If overload occurs, return to LOW power, reduce loading by decreasing the frequency setting of the PA LOADING control; then set the POWER switch to NORMAL. Check the antenna connections.
75	RF amplifier.....	PA PLATE TUNING and PA LOADING controls.	Adjust both controls until resonance occurs at a PA PLATE meter reading of between 1.6 and 1.8 amperes, depending on the output desired. Observe the color of the pa tubes through the front ports to detect possible overheating. Set successively to LEFT 4-1000A CATHODE, CENTER 4-1000A CATHODE, and RIGHT 4-1000A CATHODE; check the MULTIMETER reading at each setting. Press OFF button.....	PA GRID meter indicates between 80 and 180 ma. Antenna current increases proportionally.	
76	RF amplifier.....	MULTIMETER switch.....		All tube currents are equal within 20%.	If any tube falls outside the 20% limit, interchange tubes to determine whether the tube or circuit is defective.
77	RF amplifier.....	PLATE OFF/RESET switch.....		PLATE indicator extinguishes, all positive dc supplies de-energize.	Check latch relay K7401 (fig. 30).
78	Modulator-Oscillator Group OA-2180/FRT-51.		Apply SSB input (TM 11-5821-212-10). Set to SSB.....	Ssb indicator lights, CW/FSK indicator extinguishes.	Check indicator lamp. Check ssb relay K7407, CW/FSK relay K7406, and latch relay K7401 (fig. 30). Check ssb relay K7407 (fig. 30).
79	RF amplifier.....	SERVICE switch.....		MULTIMETER reads approximately -90 volts. Refer to Normal Indications, Item 68.	Refer to corrective measures for item No. 68.
81	RF amplifier.....	MULTIMETER switch.....	Set to POWER AMPLR BIAS. Set to ON.....		
81	RF amplifier.....	PLATE ON switch.....			

SSB OPERATION

AUTOMATIC TUNING				SSB OPERATION	
Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
82	RF amplifier-----	PA PLATE TUNING and LOADING controls.	Adjust both controls until resonance occurs when the PA PLATE meter indicates between 1 and 1.3 amperes, depending on the power output desired. Set to OFF/RESET-----	PA GRID meter reads between 15 and 25 ma.	Replace V5001 through V5003 (fig. 31). Check the antenna connections.
83	RF amplifier-----	PLATE OFF/RESET switch.	Set to OFF/RESET-----	PLATE indicator extinguishes, all positive dc supplies de-energize.	Check latch relay K7401 (fig. 30).
84	RF amplifier-----	POWER switch-----	Set to NORMAL.	CW/FSK indicator lights, SSB light off.	
85	RF amplifier-----	SERVICE switch-----	Set to CW/FSK-----	BIAS indicators on RF amplifier power supply light and remain lighted.	
86	RF amplifier-----	TUNING switch-----	Set to AUTOMATIC.		
87	RF amplifier-----	AUTOMATIC TUNING switch.	Set to OPERATE.		
88	RF amplifier-----	BUFFER TUNING, DRIVER PLATE TUNING, PA PLATE TUNING, and PA LOADING, and BAND SWITCH controls.	Adjust to detune the RF amplifier by 10 mc.		
89	RF amplifier-----	PLATE ON switch-----	Set to ON-----	PLATE indicators light on the RF amplifier and power supply. BUFFER PLATE meter indicates approximately 1,200 volts. PA SCREEN meter indicates approximately 600 volts. PA PLATE meter indicates 3,000 volts while automatic tuning is taking place, and, 5,000 volts after tuning is completed.	Same as corrective measures for item No. 68. Same as corrective measures for item No. 68. Same as corrective measures for item No. 68. Check normal power relay K7405 (fig. 30). Check automatic tuning relay K7416 (fig. 14), tuning sequence controller relay K7302 (fig. 32), and rate generator input relay K7303 (fig. 32). Check V7301 in the tuning sequence controller (fig. 32). Check carrier reinsert relay
				AUTOTUNED indicator ex-	

tinguishes while tuning progresses.

The BUFFER TUNING, DRIVER PLATE TUNING, PA PLATE TUNING, and PA LOADING controls rotate rapidly until the amplifier group is tuned. When tuning is completed, the DRIVER CATHODE meter indicates between 200 and 250 ma; the PA GRID meter indicates between 80 and 180 ma; the PA PLATE meter indicates between 1.6 and 1.8 amperes, depending on the output desired.

K7301 (fig. 14).

If both the BUFFER TUNING and DRIVER PLATE TUNING controls fail to rotate, or if both operate erratically, replace chopper G3101 and tube V3102 (fig. 33).

If the BUFFER TUNING control fails to rotate or if it operates erratically, check V3101, V3102, V3103, and chopper G3101 in the tuning servo amplifier (fig. 33).

If the DRIVER PLATE TUNING control fails to rotate or if it operates erratically, check V3102, V3104, V3105, and chopper G3101 in the tuning servo amplifier (fig. 33).

If both the PA PLATE TUNING and PA LOADING controls fail to rotate, check SERVO FIL fuse F7401 (fig. 30), tube V5201, and chopper G5202 in the servo preamplifier (fig. 32).

If both the PA PLATE TUNING and PA LOADING controls operate erratically, check tube V5201 and chopper G5202 in the servo preamplifier (fig. 32).

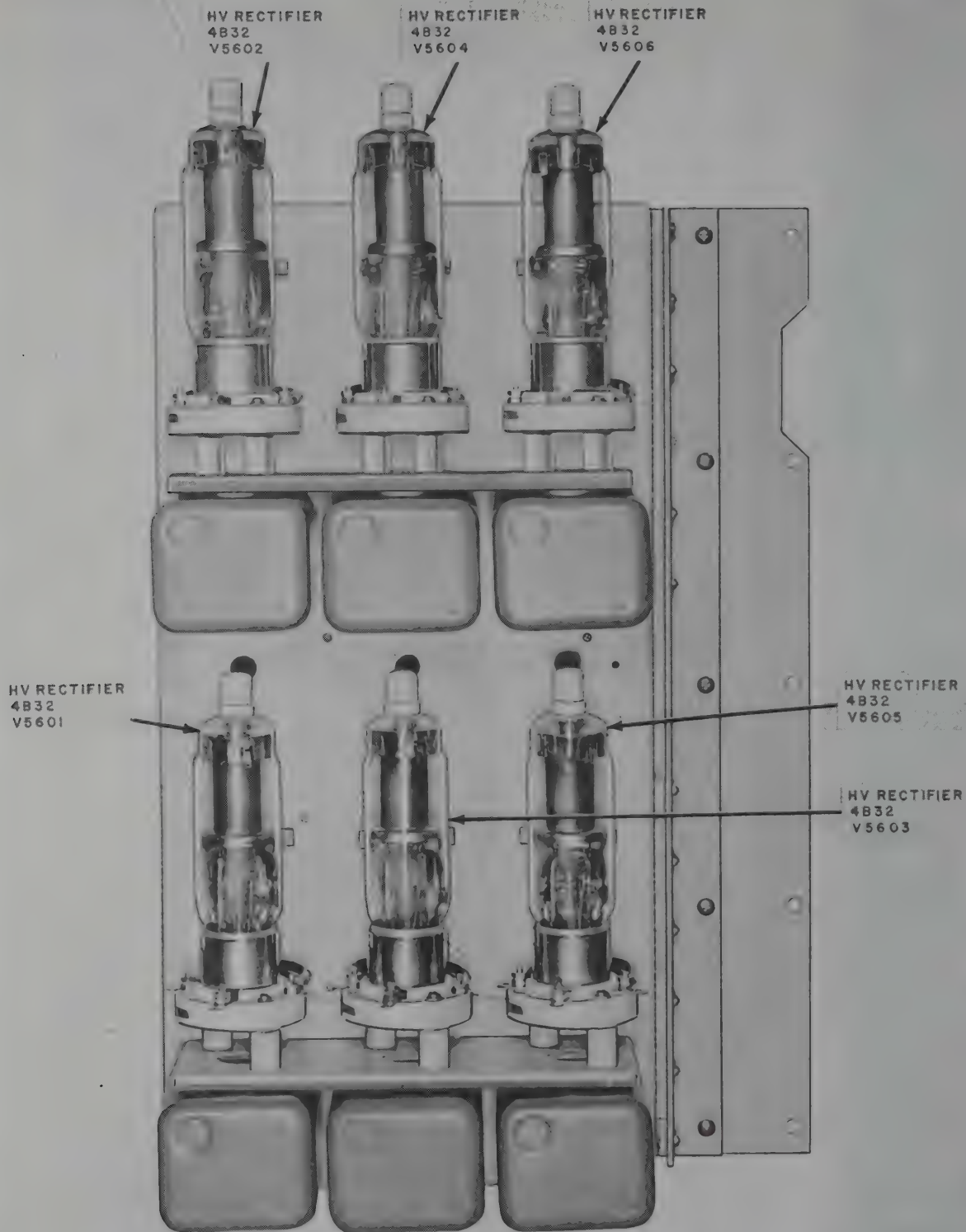
If the PA PLATE TUNING control fails to operate or if it operates erratically, check tubes V5201 and V5202 (fig. 32) and SERVO PLATE fuses F5201 and F5202 (fig. 30) in the PA TUNING servo amplifier.

A U T O M A T I C T U N I N G

C I R C U I T S

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
90	RF amplifier-----	AUTOMATIC TUNING switch.	Set to CYCLE OFF-----	<p>BUFFER TUNING, DRIVER PLATE TUNING, PA PLATE TUNING, and PA LOADING controls do not oscillate after tuning has been completed. If the input frequency is changed, or if the RF amplifier becomes detuned for some other reason, the tuning controls will operate until tuning is completed again. RF ammeter (on dummy antenna) goes through following sequence during tune-up: (1) Reading drops to zero. (2) Reading rises to three amperes. (3) Reading suddenly increases to between 6 and 7 amperes (approximately). At this time the AUTOTUNED indicator relights. During steps (1) and (2), the PA PLATE and PA SCREEN meters show decreased readings.</p>	<p>If the PA LOADING control fails to rotate or if it operates erratically, check tubes V5302 and V5303 (fig. 32) and SERVO PLATE fuses F5301 and F5302 (fig. 30) in the PA loading servo amplifier.</p> <p>Higher echelon repair required.</p>
91	RF amplifier-----	AUTOMATIC TUNING switch.	Set to RESET-----	AUTOTUNED indicator extinguishes.	Higher echelon repair required.
92	RF amplifier-----	PLATE ON switch-----	Set to ON-----	Same as normal indications, item 68.	Same as corrective measures for item No. 68.
93	RF amplifier-----	CONTROL switch-----	Set to REMOTE.		
94	Power supply-----	ALARM switch-----	Set to ALARM AUDIBLE.		

95	Power supply-----	ALARM TEST switch-----	Press in TEST position momentarily.	Alarm bells in the power supply and the remote control box ring while switch is pressed.	Check alarm relay K7402 (fig. 30).
96	Power supply-----	ALARM switch-----	Set to ALARM VISUAL.	ALARM indicators in RF Amplifier, power Supply, and remote control unit flash on and off (blink) while switch is pressed.	Check alarm indicator lamps (fig. 4, 5, 14, TM 11-5821-212-10).
97	Power supply-----	ALARM TEST switch-----	Press in TEST position momentarily.	Same as normal indications for item No. 77.	Same as corrective measures for item No. 77.
98	RF amplifier-----	PLATE OFF/RESET switch-----	Set to OFF/RESET-----	At some point during the loading increase, when the PA PLATE meter reads between 1.85 and 2.5 amperes, the equipment suddenly returns to STANDBY ON condition, and the alarm rings or the ALARM indicators blink).	Check K7410 (fig. 30).
99	RF amplifier-----	PA TUNING and PA LOADING controls, PA PLATE meter.	Adjust both controls to increase loading on RF amplifier. Observe PA PLATE meter at resonance after each increase in loading. Do not permit PA PLATE to exceed 2.5 amperes.		
100	RF amplifier-----	PA TUNING and PA LOADING controls.	While equipment is in STANDBY OFF condition, reset controls to approximate positions for normal loading.		



TM5821-212-20-34

Figure 28. Rectifier chassis, 5000-volt, tube location.

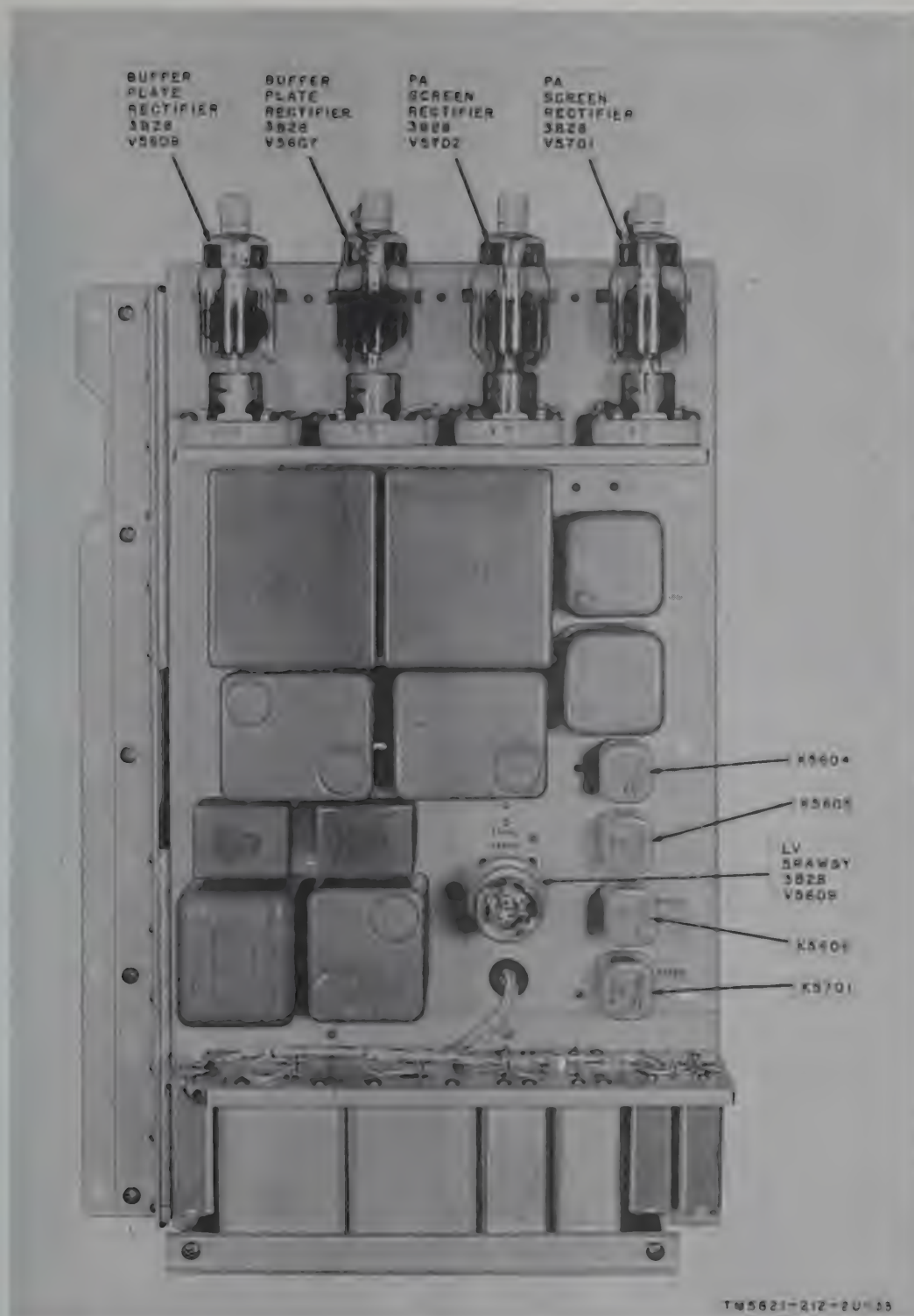
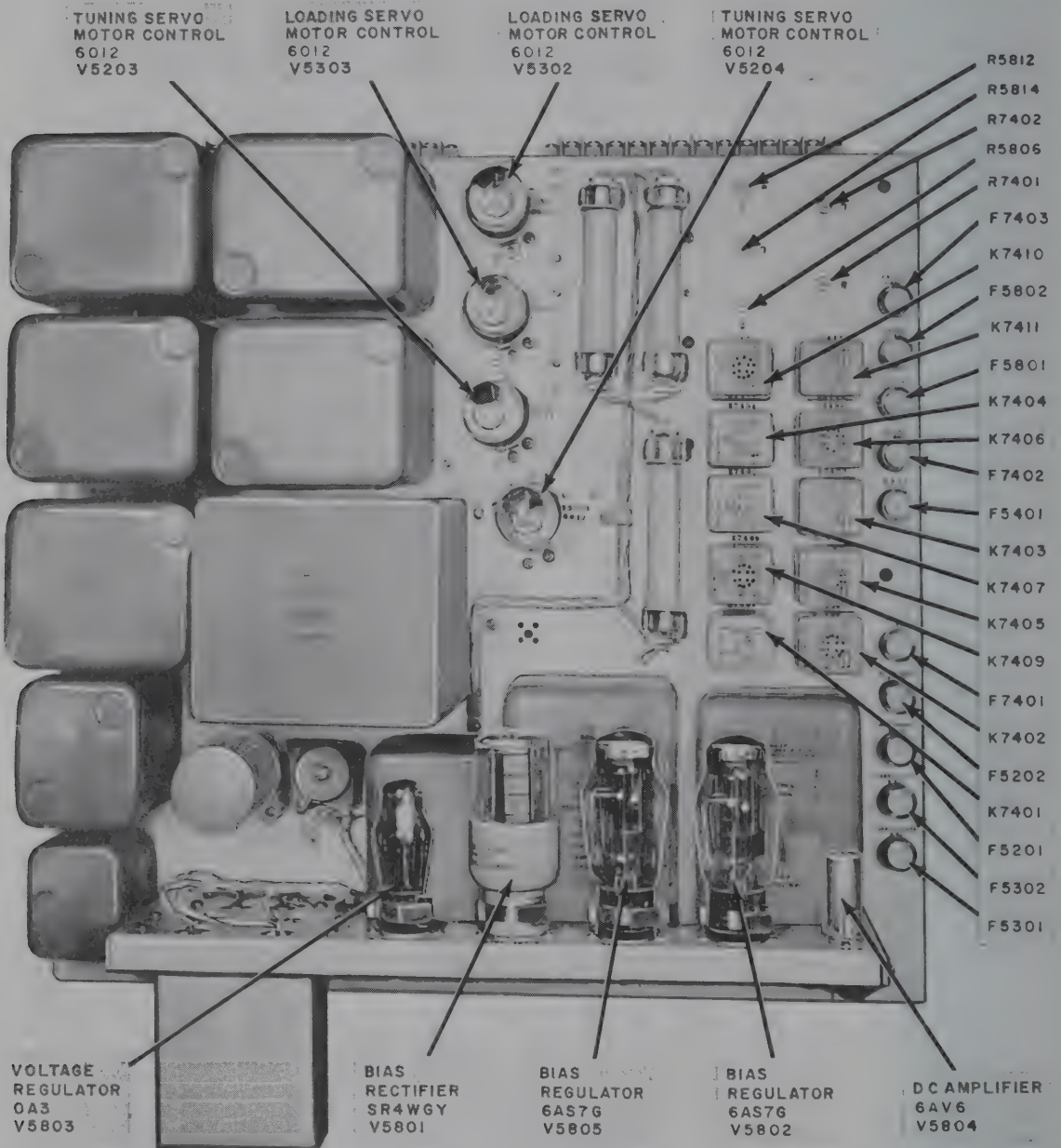


Figure 29. *H_v power supply, low-voltage rectifier chassis, tube and relay location diagram.*

24. Tube Replacement by Substitution

a. When trouble occurs, check all cabling, connections, control settings, and the general condition of the equipment before attempting removal of electron tubes. Try to isolate the trouble to a particular stage or plug-in assembly.

b. Replace tubes, one at a time, with new tubes. Discard a tube only if its defect is obvious or if replacement by a new tube clears up the trouble. If tube substitution does not cause the transmitting set to operate, higher echelon repair is required.



TM5821-212-20-32

Figure 30. RF amplifier, control and bias supply chassis, front view.

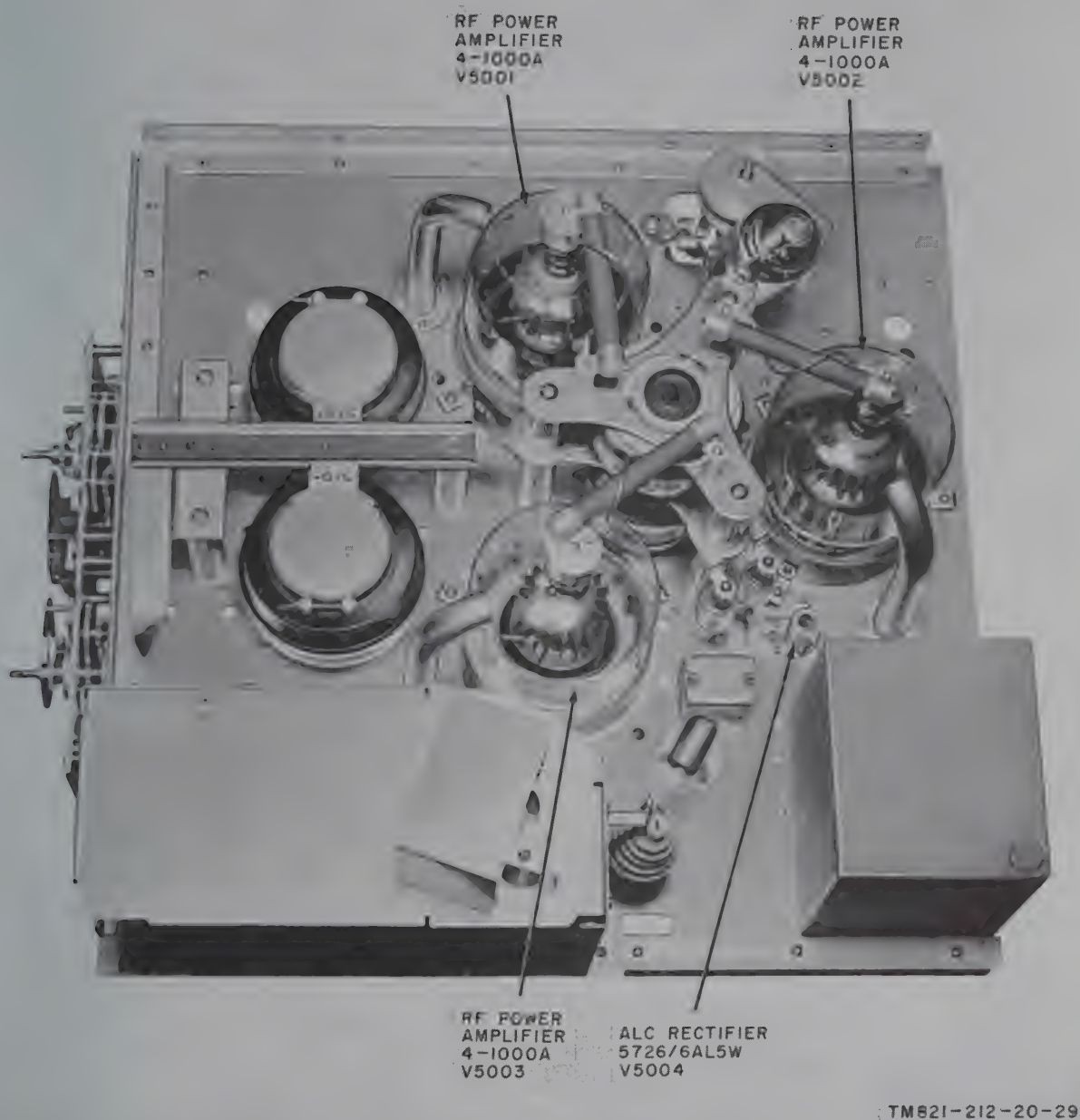
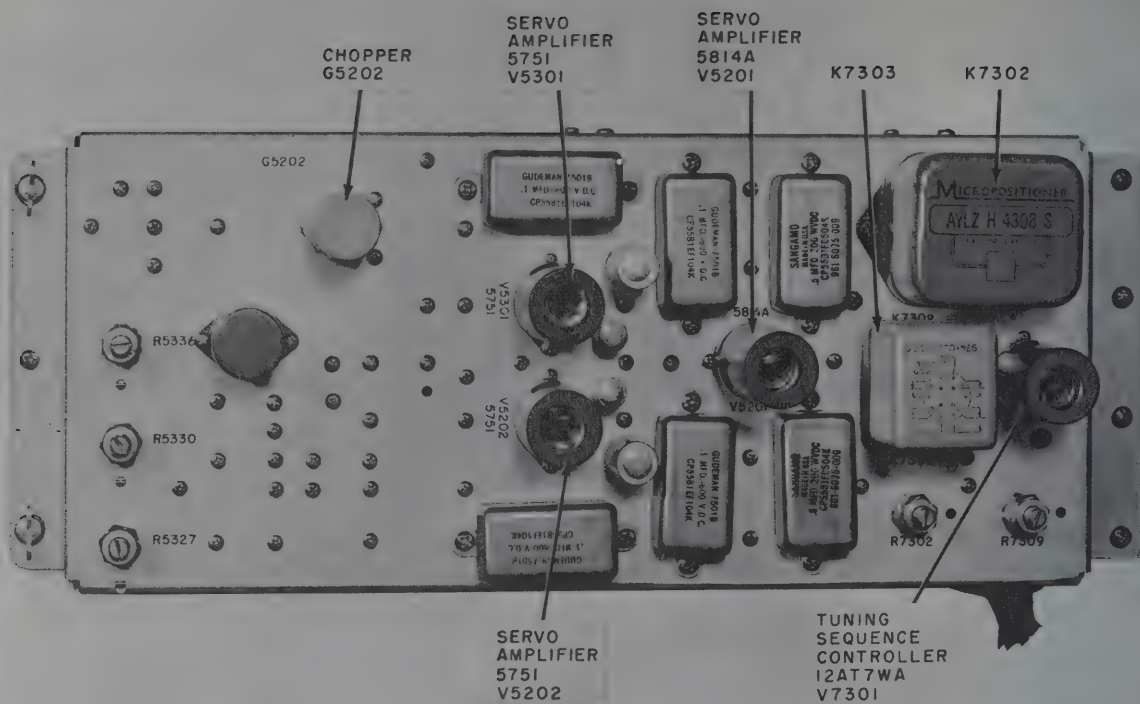
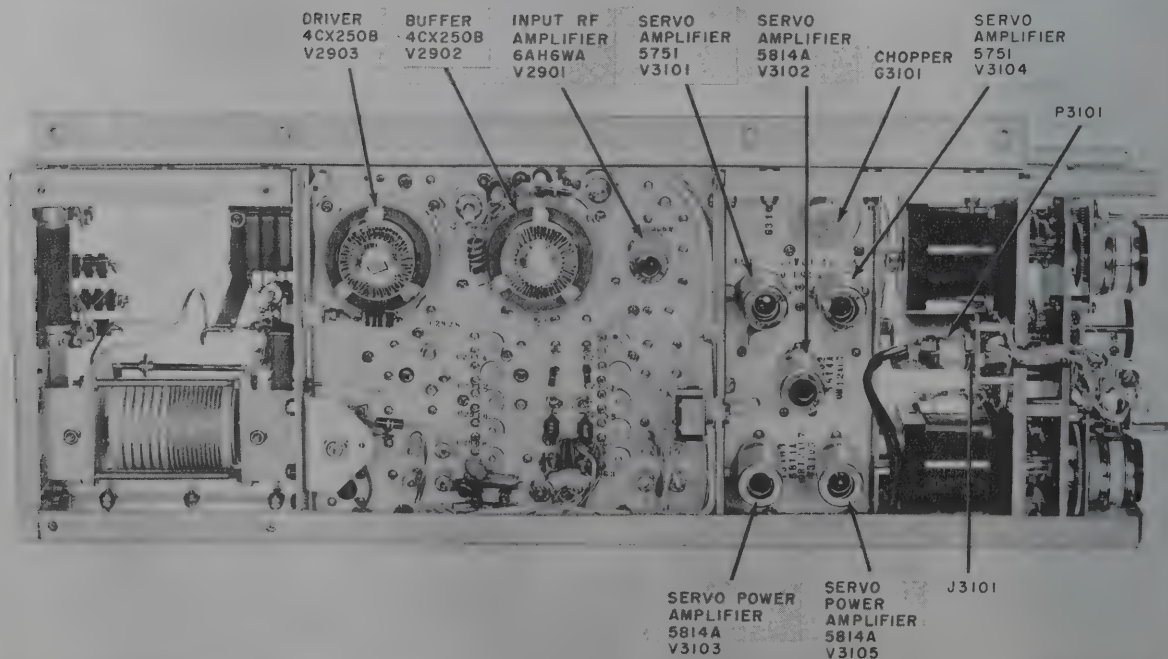


Figure 31. RF amplifier, power amplifier chassis, top view.



TM5821-212-20-30

Figure 32. RF amplifier, servo preamplifier chassis, top view.



TM5821-212-20-31

Figure 33. RF amplifier, driver chassis, top view.

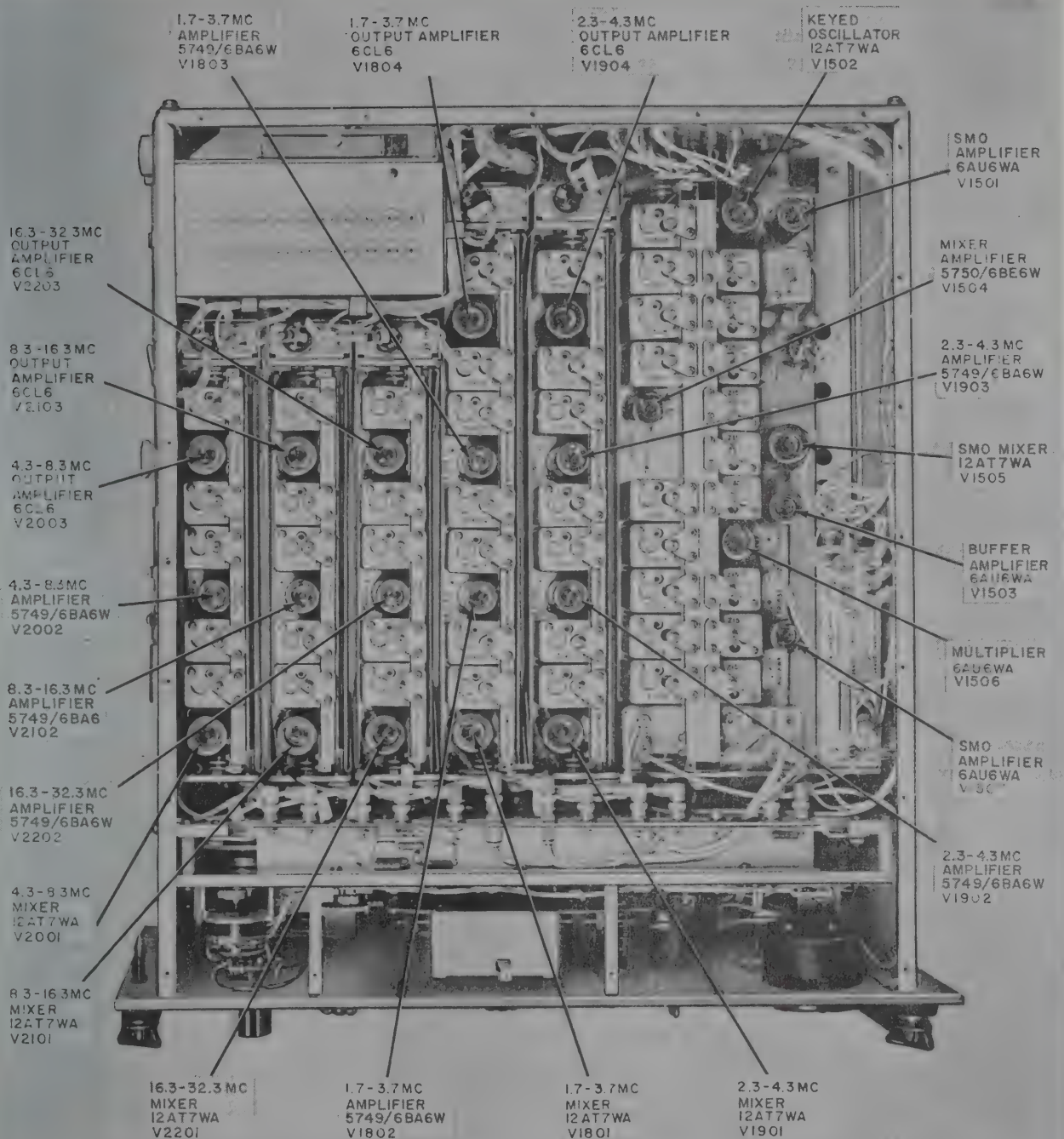
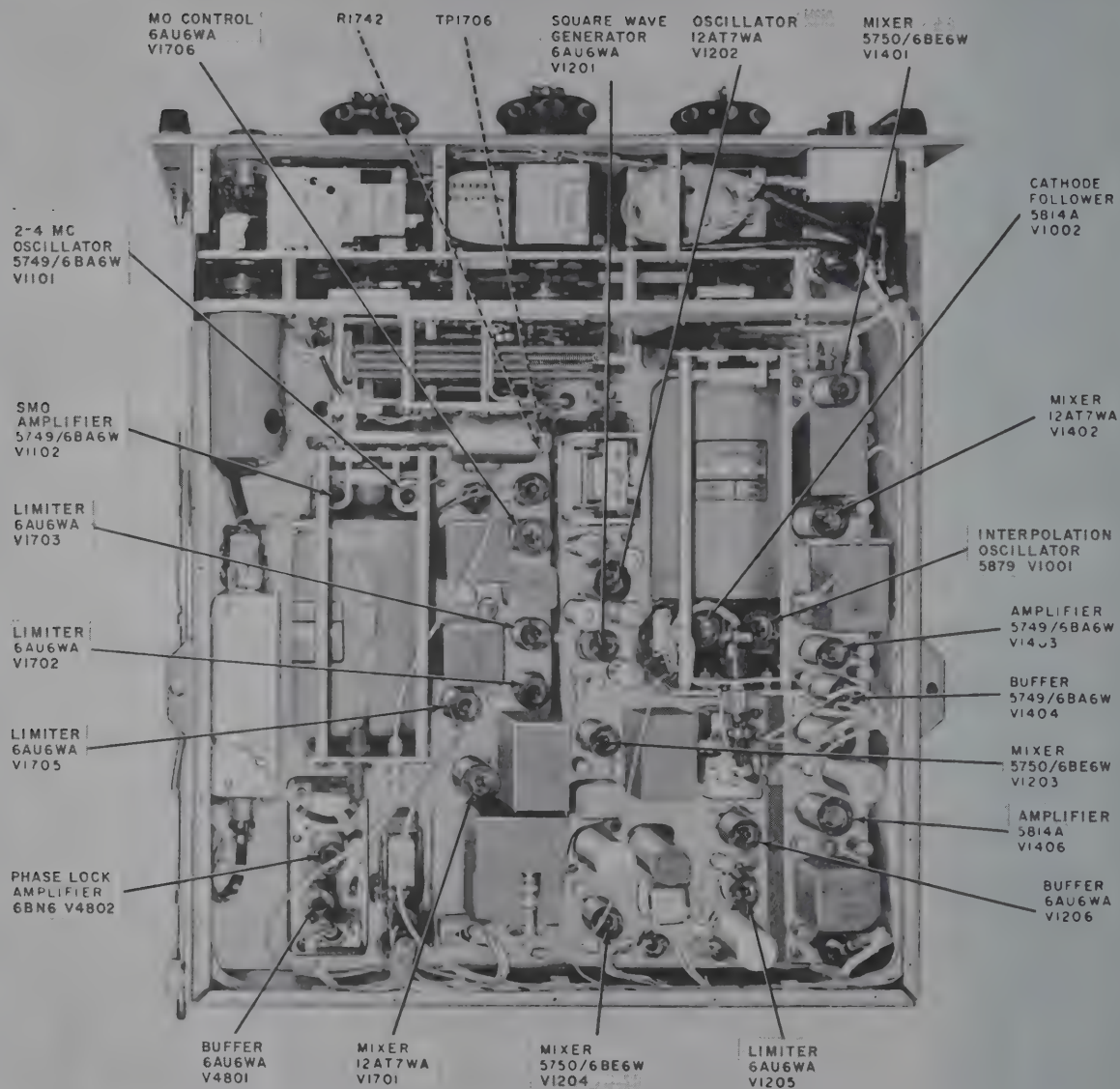
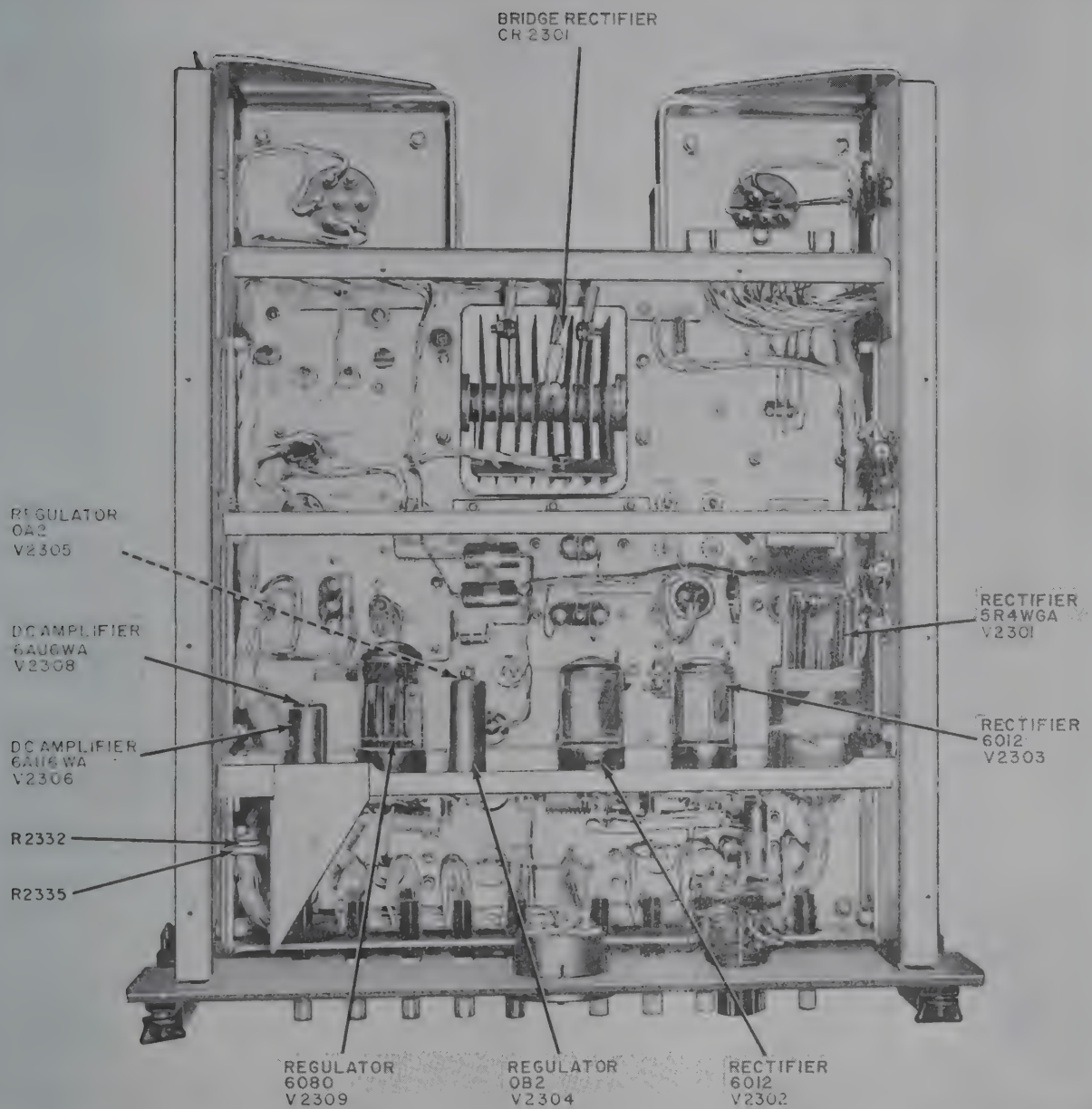


Figure 34. Exciter monitor chassis, top view, tube location.



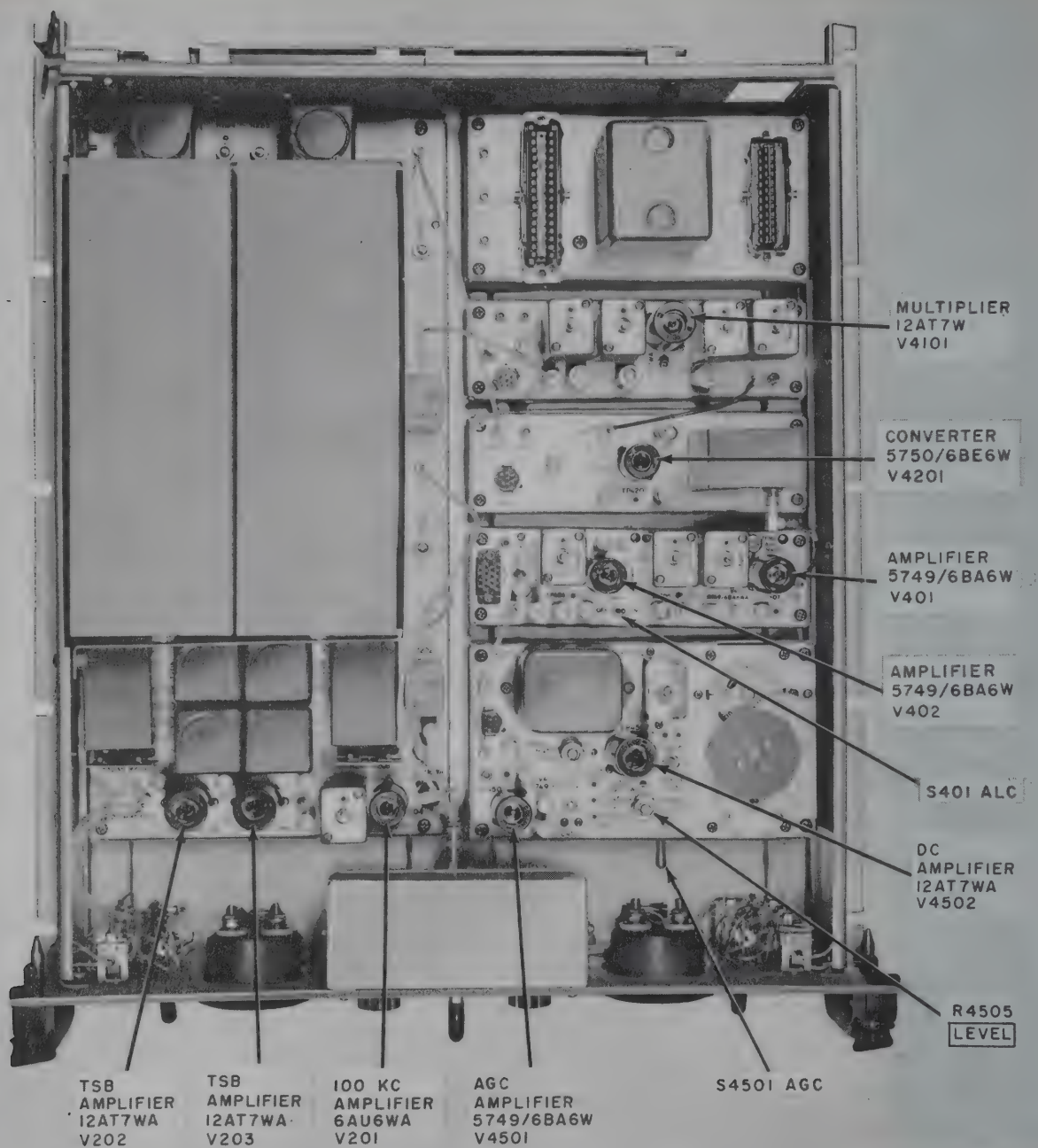
TM5821-212-20-37

Figure 35. Exciter monitor chassis, bottom view, tube location.



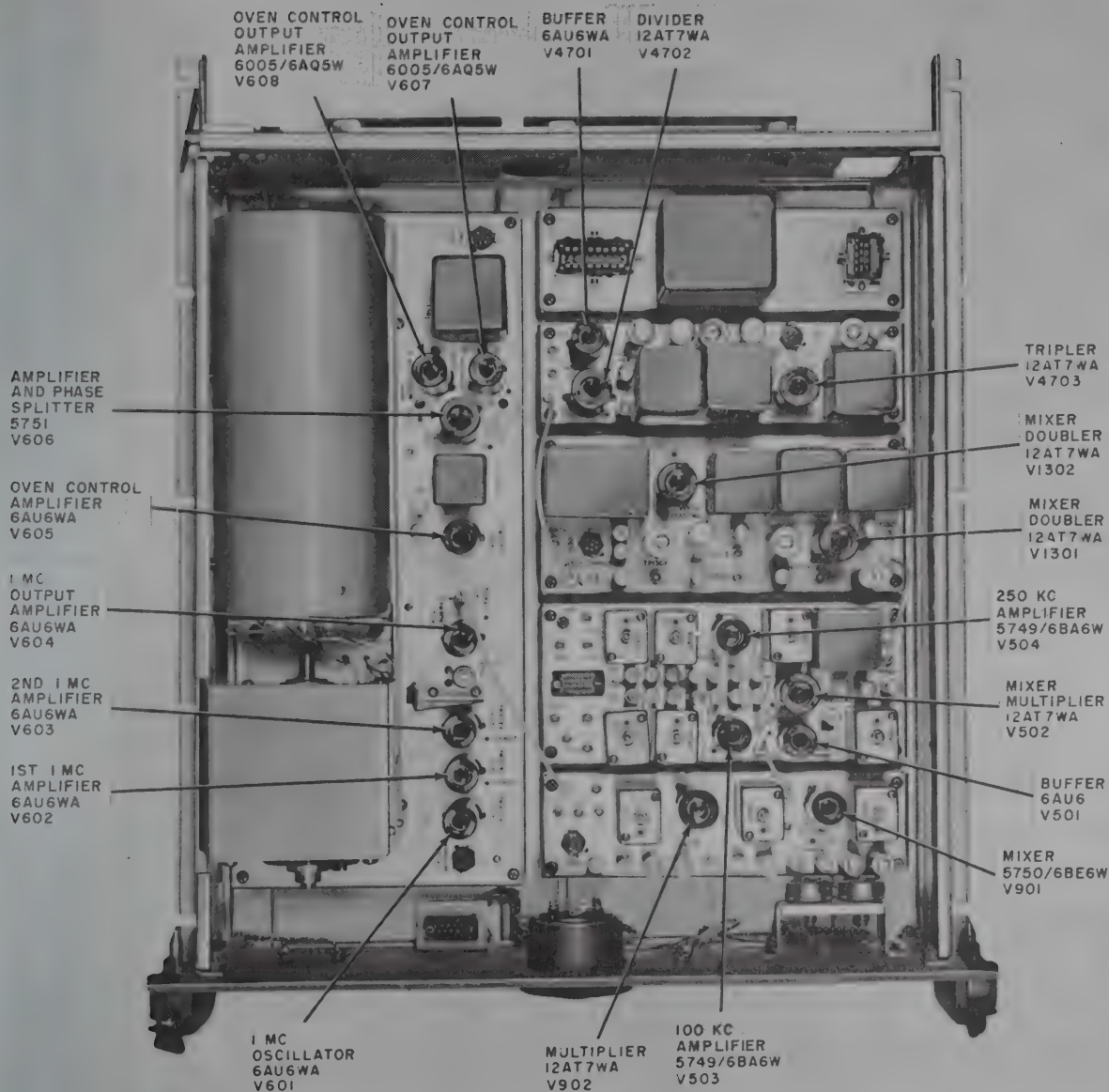
TM5821-212-20-38

Figure 36. Modulator oscillator power supply, top view.



TM5821-212-20-39

Figure 37. TSB modulator, top view.



TM5821-212-20-36

Figure 38. Frequency standard chassis, tube location.

25. Alarm Circuits Check

Warning: The procedures described in this paragraph check out the alarm circuits. To check these circuits, it is necessary to disable protective devices. Remove all disabling equipment immediately after

completing the procedures in this paragraph. **DO NOT LEAVE THE EQUIPMENT LOCATION WHILE PROTECTIVE DEVICES ARE DISABLED.** Set the rf amplifier STANDBY switch to OFF and ground circuits before reaching inside the cabinet. Do not service this equipment alone.

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
1	Power supply	All interlock and shorting switches.	Block door interlock S6102 (fig. 40) by closing the switch manually and pushing up on a small pin located at the base of the switch. The B+ shorting switches are blocked by placing a small piece of wood (such as a pencil) in the top left-hand corner of the cabinet thus preventing the locking lever (fig. 40) from actuating shorting switches S6106 through S6109 (fig. 40).		
2	RF amplifier	PLATE ON switch	Set to ON	PLATE indicators light on the RF amplifier and hv power supply.	Refer to paragraph 23c step 68.
3	Power supply	HV PLATE circuit breaker CB6003.	Set to OFF, then set back to ON	Alarm indicators blink on all cabinets and on the remote control box while the circuit breaker is OFF.	Check K5604 (fig. 29).
4	Power supply	BUFFER PLATE circuit breaker CB6006.	Same as above	Same as above	Check K5605 (fig. 29).
5	Power supply	PA SCREEN circuit breaker CB6010.	Same as above	Same as above	Check K5701 (fig. 29).
6	Power supply	All interlock and shorting switches.	Remove blocking device.		
7	Power supply	Cabinet doors	Close cabinet doors.		

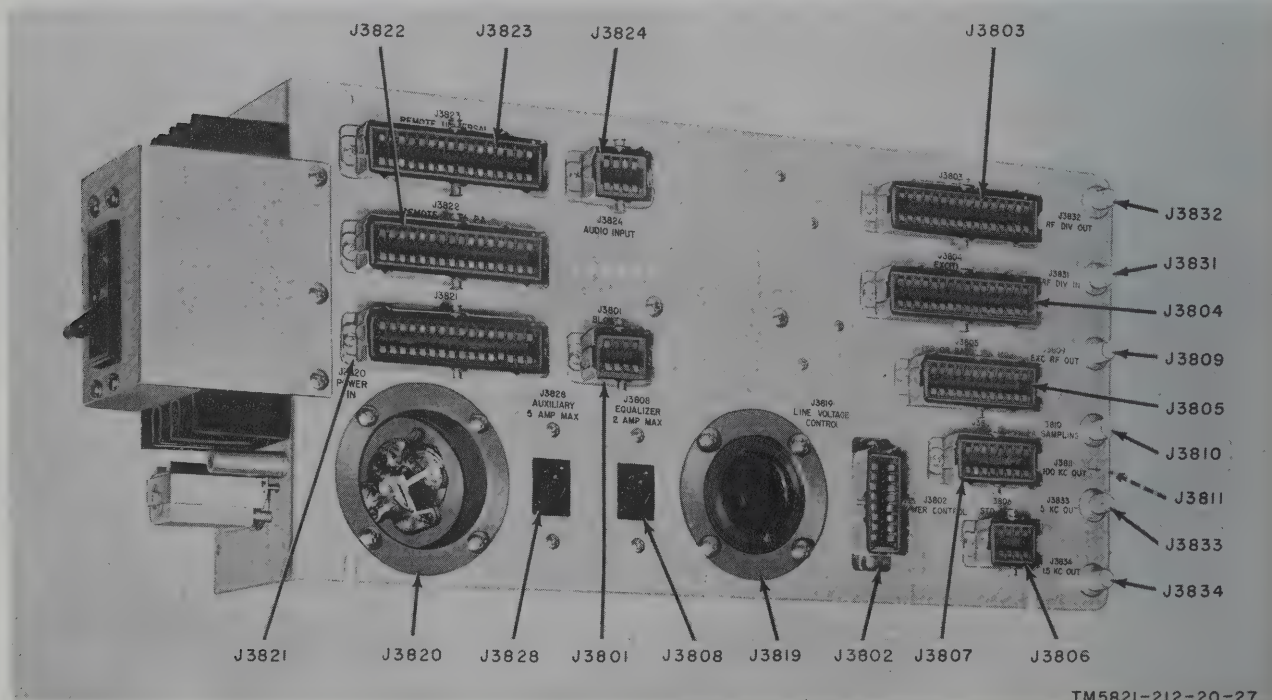
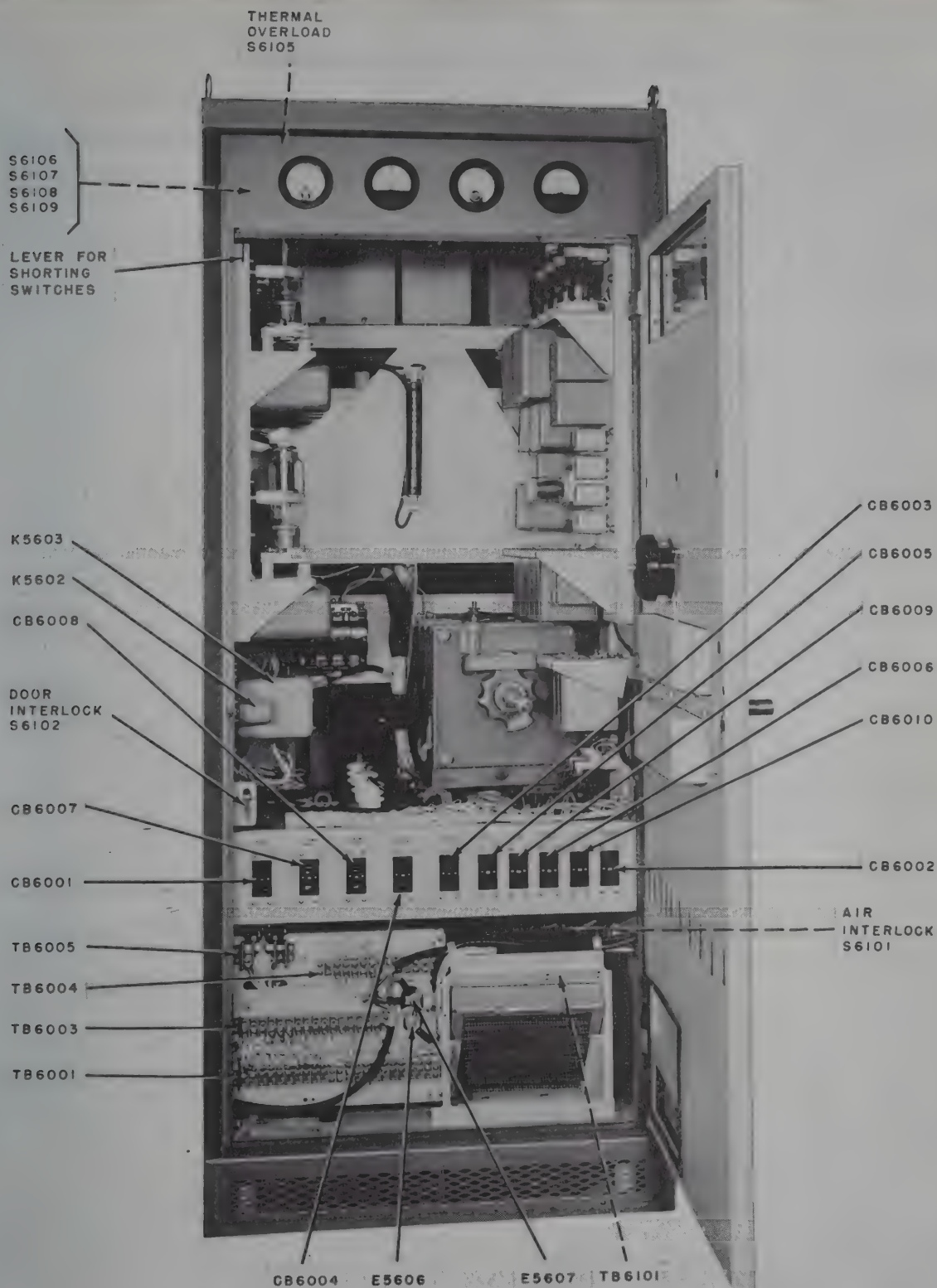


Figure 39. Modulation oscillator junction box, jack location.



TM5821-212-20-41

Figure 40. H_v power supply, front view.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE

26. Disassembly

To disassemble the transmitting set:

- a.* Disconnect all cabling to the equipment.
- b.* Disconnect all intercabinet cables.
- c.* If the bases are bolted to the floor, remove the bolts.
- d.* Remove bolts that hold cabinets together.

27. Repackaging for Shipment or Limited Storage

The transmitting set may be shipped from the using organization without special packaging. If repackaging is done, the exact procedures depend on the materials available and the conditions under which they are to be shipped. The information concerning the original packaging (par. 5) can be helpful.

APPENDIX I

HOOK-UP WIRE CODE AND DATA

1. Hookup Wire Code

First letter	Type of wire	Second letter	AWG # wire size	Third letter	Shielding	Body or tracer color	Numeral
A	Cotton braid over plastic.....	A	22	S	Shielded	Black	0
B	Bus-bar round tinned copper.....	B	20	None	Unshielded	Brown	1
C	JAN type WL (600 volts).....	C	18			Red	2
D	Miniature JAN wire (Prodelin).....	D	16			Orange	3
		E	14			Yellow	4
F	Extra-flexible varnished cambric.....	F	12			Green	5
G	General Electric Deltabeston.....	G	10			Blue	6
		H	8			Violet	7
		J	6			Gray	8
K	Neon sign cable (15,000 volts).....	K	4			White	9
N	Single conductor stranded (not rubber).....	L	2				
P	Single conductor stranded (rubber-covered).....	M	1				
		N	0.				
R	JAN type SRIR (1,000 volts).....	P	00				
V	JAN type SRHV (2,500 volts).....	Q	000				
		R	0000				

2. Wire Data

Wire	Symbol group
Shielded wire, JAN type WL, #22 AWG, white with red and green tracers.....	CAS925
Unshielded wire, bus-bar round tinned copper, #18 AWG, white with black tracer.....	BC90
Shielded wire, #18 AWG, black.....	CS0
Unshielded neon sign cable, #14 AWG, black.....	KE0
Unshielded wire, #10 AWG, white with black and green tracers.....	G905

MAINTENANCE ALLOCATION

1. General

a. The maintenance allocation chart assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. Explanation of the columns is as follows:

- (1) *Part of component.* Only the nomenclature or standard item name is listed in this column. Additional descriptive data are included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and subassemblies are in alphabetical sequence with their components listed alphabetically immediately below the assembly listing.
- (2) *Maintenance function.* This column indicates the various maintenance functions allocated to the echelon capable of performing the operation. These are defined as follows:
 - (a) *Service.* To clean, preserve, and to replenish fuel and lubricants.
 - (b) *Inspect.* To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.
 - (c) *Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.
 - (d) *Repair.* To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment, and skills available, to include welding, grinding, riveting, straightening, adjusting, etc.
 - (e) *Rebuild.* To restore to a condition comparable to new by disassembling the item to determine the condition of its component parts and reassembling it, using serviceable, rebuilt, or new assemblies, subassemblies, and parts.
- (3) *1st, 2d, 3d, 4th, 5th echelon.* The symbol X indicates the echelon responsible for per-

forming that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

- (4) *Tools required.* This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment listed. The grouping of codes in this column of the Maintenance Allocation Chart indicate the tool, test, and maintenance equipment required to perform the maintenance function.
- (5) *Remarks.* Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding columns.

c. Columns in the allocation of tools for maintenance functions are defined as follows:

- (1) *Tools required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.
- (2) *1st, 2d, 3d, 4th, 5th echelon.* A dagger indicates the echelons allocated the facility.
- (3) *Tool code.* This column lists the tool code assigned.
- (4) *Remarks.* Entries in this column are used to clarify data cited in the other columns.

2. Maintenance by Using Organizations

When this equipment is used by signal service organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

3. Mounting Hardware

The basic entries of the Maintenance Allocation Chart do not include mounting hardware such as screws, nuts, bolts, washers, brackets, clamps, etc.

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH.	(5) 3RD ECH.	(6) 4TH ECH.	(7) 5TH ECH.	(8) TOOLS REQUIRED	(9) REMARKS
TRANSMITTING SET, RADIO AN/FRT-51	inspect replace repair	X		X X			1, 3, 4, 8, 9, 10, 11 14, 15, 16, 17 18, 19 1-19 Incl	Preventive Maintenance
AMPLIFIER, RADIO FREQUENCY AN-1154A/G	rebuild service replace repair rebuild			X X X		X		Separate MAC
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	replace			X				
CONNECTOR, PLUG, ELECTRICAL	service			X				Separate MAC
CONTROL, AMPLIFIER C-1637/G; C-1637A/G	replace replace repair rebuild		X	X		X		
DUMMY LOAD, ELECTRICAL DA-212/FRT-51	replace repair rebuild		X	X		X		
AMMETER	replace repair			X		X		

MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH.	(5) 3RD ECH.	(6) 4TH ECH.	(7) 5TH ECH.	(8) TOOLS REQUIRED	(9) REMARKS
AN/FRT-51 (continued)								
CAP, ELECTRICAL	replace		X					
CONNECTOR, RECEPTACLE	replace			X				
FUSE, CARTRIDGE	replace	X						
FUSEHOLDER	replace			X				
IMPELLER, FAN, CENTRIFUGAL	replace			X				
INSULATOR, STANDOFF	replace			X				
KNOB	replace		X					
LEAD, ELECTRICAL	replace			X				
MOTOR, ALTERNATING CURRENT	replace			X				
	repair					X		
RESISTOR	replace			X				
SWITCH	replace			X				
MODULATOR-OSCILLATOR GROUP OA-2180/FRT-51	service							Separate MAC
	replace			X				
	repair			X				
	rebuild					X		
POWER SUPPLY PP-1234/G	service							Separate MAC
	replace			X				
	repair			X				
	rebuild					X		

ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH.	2ND ECH.	3RD ECH.	4TH ECH.	5TH ECH.	TOOL CODE	REMARKS
AN/FRT-51 (continued)							
ANMETER ME-65/U						1	
ANALYZER, SPECTRUM TS-723/U						2	
AUDIO OSCILLATOR TS-382/U						3	
CAPACITIVE VOLTAGE DIVIDER HP-453A						4	
FREQUENCY METER AN/URM-79						5	
FREQUENCY METER AN/URM-80						6	
FREQUENCY METER AN/USM-26						7	
FREQUENCY METER SCR-211						8	To be replaced when Frequency Meter AN/URM-32 and Power Supply PP-1243/U become available
MULTIMETER AN/URM-105						9	
MULTIMETER, METER ME-26/U						10	
OSCILLOSCOPE OS-8A/U						11	
RESISTANCE BRIDGE 2M-4/U						12	
TEST SET, ELECTRON TUBE TV-2/U						13	
TEST SET, ELECTRON TUBE TV-7/U						14	
VOLTMETER, METER ME-30A/U						15	
TOOL EQUIPMENT TE-113						16	
THERMOMETER, 0-100°C, WESTON 2261 (or equal)						17	
WRENCH TORQUE, 0.5 in/lb, STURTEVANT F160-1 (or equal)						18	
METER, TORQUE INDICATING, 0-20 in/oz RANGE WATERS TYPE 6000-4 (or equal)						19	

By Order of *Wilber M. Brucker*, Secretary of the Army:

L. L. LEMNITZER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (2)
Def Atomic Spt Agcy (5)
CNGB (1)
Tech Stf, DA (1) except
CSigO (18)
Tech Stf Bd (1)
USA Arty Bd (1)
USA Armor Bd (1)
USA Inf Bd (1)
USA AD Bd (1)
USA Abn & Elct Bd (1)
USA Avn Bd (1)
USA ATB (1)
USCONARC (5)
US ARADCOM (2)
US ARADCOM Rgn (2)
OS Maj Comd (5)
OS Base Comd (5)
Log Comd (5)
MDW (1)
Armies (5) except
First US Army (7)
Corps (2)
Div (2)
USATC (2)
Svc Colleges (5)
Br Svc Sch (5) except
USASCS (25)
Gen Dep (2) except
Atlanta Gen Dep (None)
Sig Sec, Gen Dep (10)
Sig Dep (17)
Army Pictorial Cen (2)
Engr Maint Cen (1)

USA Ord Msl Comd (3)
USASSA (15)
USASSAMRO (1)
USA Sig Pub Agcy (8)
USA Sig Engr Agcy (1)
USA Comm Agcy (2)
USA Sig Eqp Spt Agcy (2)
USA Sig Msl Spt Agcy (13)
WRAMC (1)
AFIP (1)
AMS (1)
Ports of Emb (OS) (2)
Trans Terminal Comd (1)
Army Terminals (1)
OS Sup Agcy (1)
Yuma Test Sta (1)
Sig Lab (5)
Sig Fld Maint Shops (3)
Mil Dist (1)
USA Corps (Res) (1)
Sector Comd, USA Corps (Res) (1)
JBUSMC (2)
Units org under fol TOE:
11-7 (2)
11-16 (2)
11-57 (2)
11-98 (2)
11-117 (2)
11-155 (2)
11-500 (AA-AE) (2)
11-557 (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

